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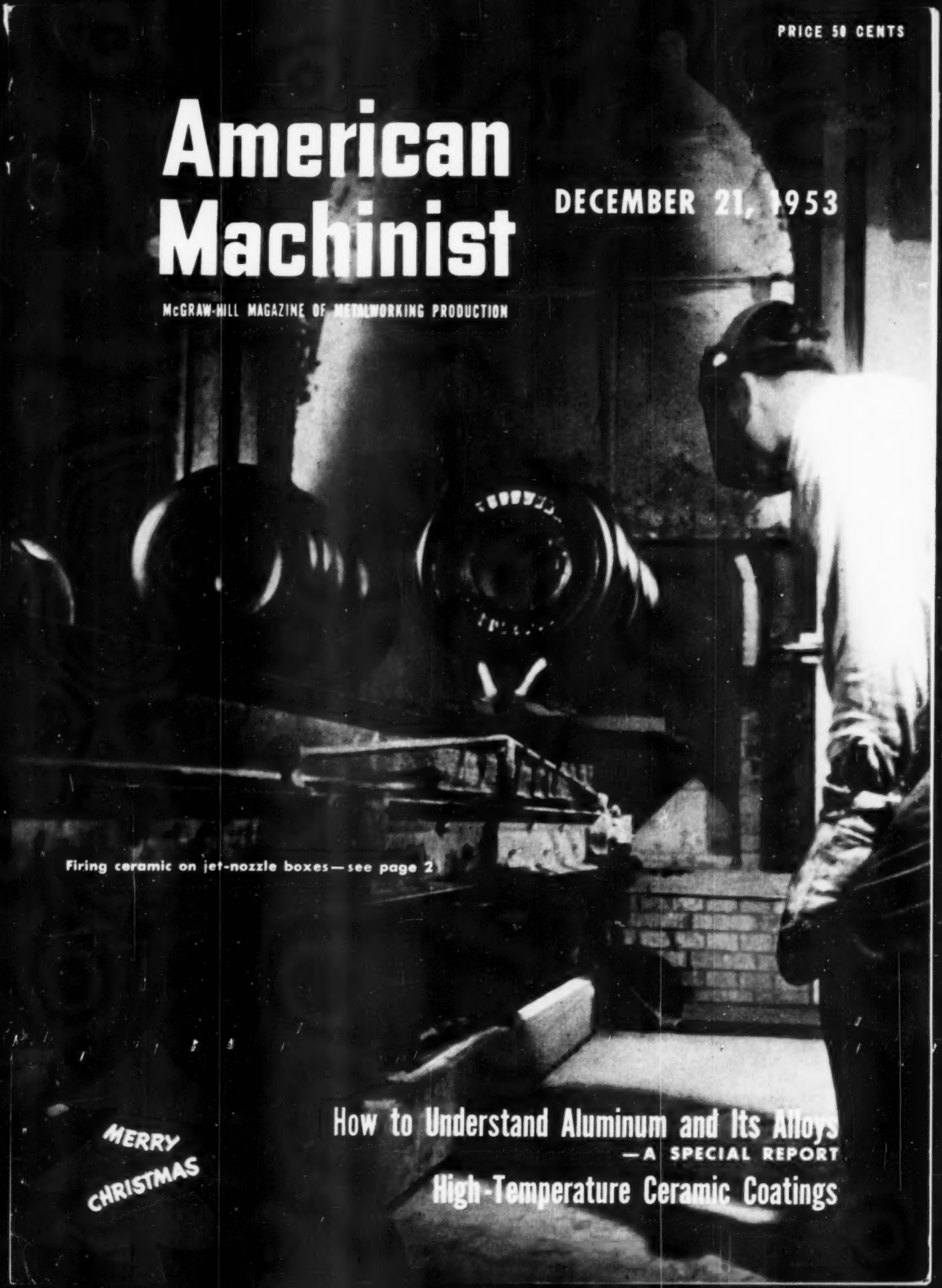
American Machinist

DECEMBER 21, 1953

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

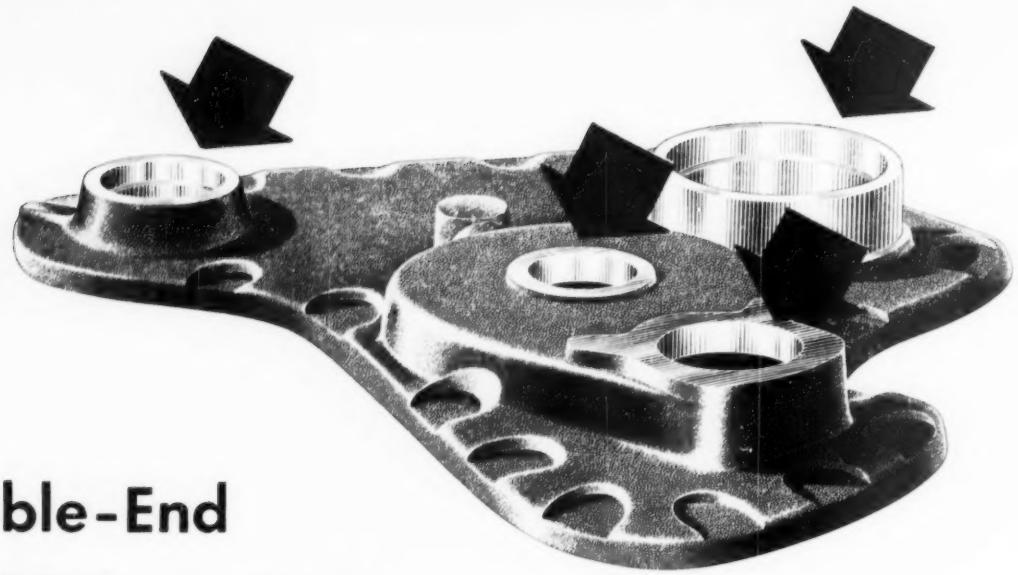


Firing ceramic on jet-nozzle boxes—see page 2

MERRY CHRISTMAS

How to Understand Aluminum and Its Alloys
—A SPECIAL REPORT

High-Temperature Ceramic Coatings



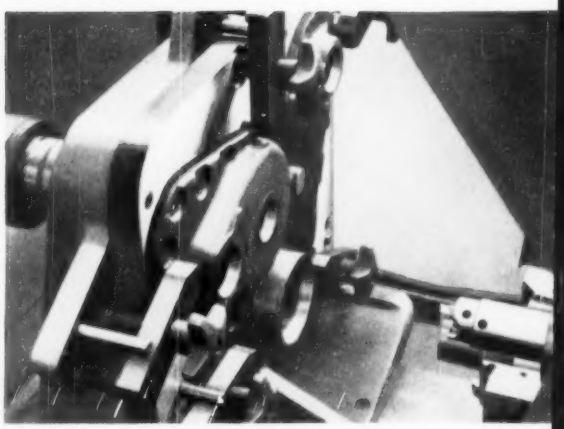
Double-End Heald Bore-Matic does a 5-HOUR JOB

in 12 MINUTES

● Precision finishing the four bearing holes in this gear case cover used to be a 5-hour job — requiring separate operations on different machines. But now it's done in *12 minutes flat* — on a single Heald Model 322 Bore-Matic. That's a saving of 4 hours and 48 minutes per part!

All operations, including boring, facing, chamfering and turning, are performed at a single loading, in one high-speed automatic cycle. Four boringheads are used — one on the left-hand bridge and three on the right. The work is automatically presented to the two sets of heads in sequence, after which it returns to center for reloading.

Remember — when it comes to precision finishing, it pays to come to Heald.



Internal and Rotary Surface Grinding Machines and Bore-Matics

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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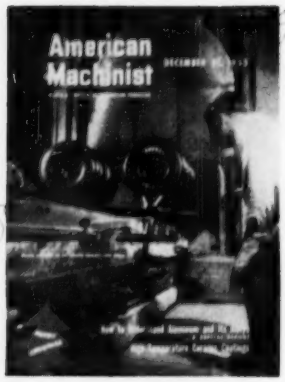


chips

FIRING FOR A FUTURE . . . Our cover shows nozzle boxes for superchargers being removed from the furnace at Bettinger Corp's Waltham, Mass, plant where heat-resistant ceramic coatings are applied. Ordinary mild steel and stainless are coated so they will last as much as two to three times as long at temperatures over 1500 F, and indefinitely at temperatures below that limit. Bettinger has added high-temperature coatings to its line of industrial decorating panels, and is now the largest producer in a field of four manufacturers. Engine parts are received from the makers, coated to a thickness not over 0.0015 in., and shipped back ready for assembly. The thin film makes a large difference in performance. (See story on page 97 by Fred Shaw, vp & general manager.)

APPLIANCE PARK . . . Largest G E plant to date, Appliance Park, near Louisville, Ky, centralizes production for washers, ranges, refrigerators, and freezers—each in its own building. Further, each building has its own general manager. Building design is flexible for design changes, but specifically for one product. The plant is 45% complete, so here is a preview, in six pages of pictures.

GRINDING POWDER CHAMBERS . . . Steady progress has been made in adapting grinding to the former hand job of finishing powder chambers of guns. The latest step is to the 120-mm gun; the 155-mm comes next. Bryant Chucking Grinder developed the machine for Watervliet Arsenal. It produces four tapers under a dual-control contour mechanism of a new type. Grinding time has been cut from 23 to 7½ hr, will come down further.

ALUMINUM UNDERSTANDING . . . Sam Storchhein, engineer-in-charge at the Bayside, NY, lab of Sylvania, is back again, this time with a 12-page Special Report on understanding aluminum and its alloys. It describes the alloys, effects of addition elements, heat-treatment, cold-working, phases—and provides a table of compositions and qualities, as well as giving designations.

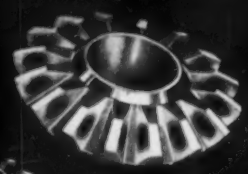
BEVEL-GEAR GENERATOR . . . A shop shaper, with the proper tooling, can generate bevel gears. Haim Murro describes the setup and gives the formula in two quick pages.

HOT LATHE . . . Bethlehem Steel indicates large turbine rotors to 0.001-in. runout by rotating them between centers on a lathe within a furnace at 1000 F. A page tells the story.

FOREIGN EFFECTS . . . Frederick S Blackall, Jr, president of Taft-Peirce and the ASME, made a significant talk on machine-tool designs in Cincinnati recently. We bring you a 3-page summary herewith. He discusses the idea of simplified machine tools and of effects of European competition on our designs.

COMING . . . Jan 4 *AM* starts off the new year with several interesting articles. The Special Report is on trepanning of a spectacular sort. The lead article shows how and why to hollow-grind carbide clamp-type inserts. There are other articles on the Paducah (Ky) AEC plant, on bore grinding, international tolerances, rocket tubes, gun drilling, and drawing dies.

COATINGS EXPERT . . . Fred B Shaw, author of our article on ceramic coatings in this issue, has contributed heavily to the industry by directing the construction and production planning for the first high-temperature-ceramic-coating plant to be built for mass production (see story, p 97). He is also responsible for the development of porcelain on steel chalkboards, and for special coatings for escalator-step risers. He is a graduate of MIT, and has been vp of Walker & Pratt Mfg Co, assistant to the president of Leonard & Baker Stove Co, and is now vp and general manager of Bettinger



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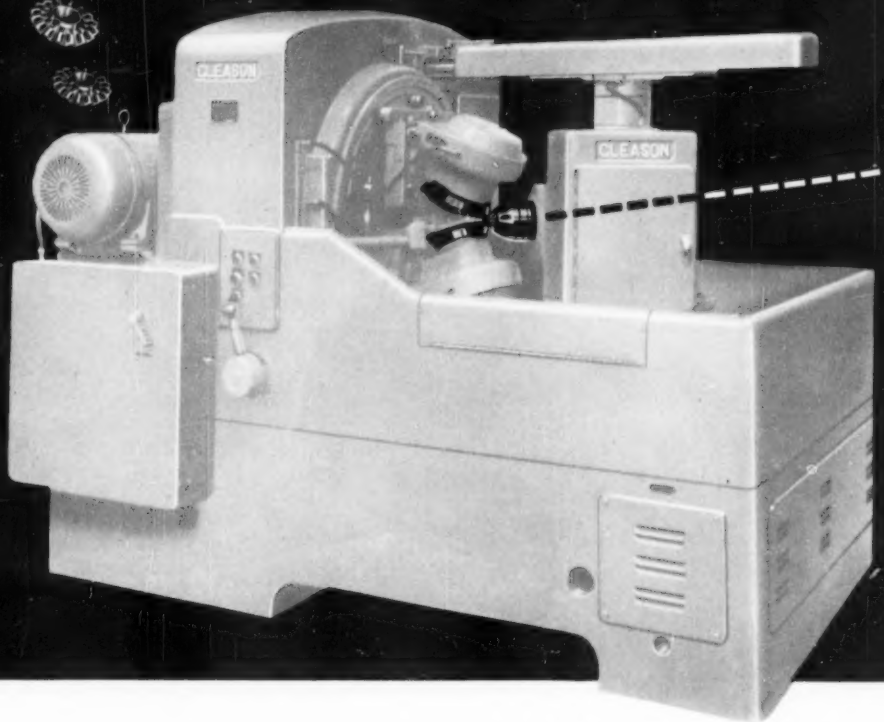
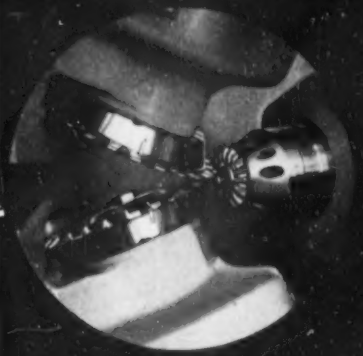
in one operation!





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Provide
Continuous Cutting Action
FINER FINISH
MORE PRODUCTION
LESS DOWN TIME
FOR SHARPENING

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No. 104 Cutter Sharpener: Fully automatic wet grinding—angles easily set and maintained—simplified set-up and changeover.

No. 13 Tester: Practical running check provides precise testing over a wide range of gear specifications. Brake load and multi-speed drive simulate actual operating conditions.

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***FROM 16 DP TO 3 DP, 8½" DIAMETER, 1⅜" FACE**

Newly developed to generate better bevel gears and pinions *faster* at lower cost. Cuts many sizes with minimum set-up time, few cutters. Cam-actuated generating roll insures maximum efficiency in the cutting cycle. Ideal for volume or short-run production.

BULLETINS ON REQUEST

For all bevel gear design and production problems, Gleason Engineering Service is available throughout the world. Please submit prints and complete data.

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BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS
1000 UNIVERSITY AVE. • ROCHESTER 3, NEW YORK

For Dad...from Johnny
AND THE MAGIC OF MACHINE TOOLS

Johnny's gift to his Dad might have been a glass fibre casting rod, a pair of sox, a carton of cigarettes. Whatever it was, you can be sure that machine tools were somewhere in the background, for machine tools are the basic equipment for Santa's workshop. The glass fibre casting rod was ground on a Cincinnati Filmatic Centerless Grinder; ground to the accurate taper that adds so much to the pleasure of fishing. The sox were knit on a machine that was made on machine tools, and more than likely some of them were Cincinnatis. And cigarettes, too, owe their uniformity and low price to accurate, high speed machines made on machine tools. Everything under the tree, from Mother's dainty blouse to the gay paper wrappings, could not have been produced to such high quality and so abundantly without the aid of machine tools.

Here at Cincinnati Milling we build the kind of machine tools that make for better living every day of the year. Milling, broaching, die sinking, Hydroforming, grinding, flame hardening are some of the basic types of machine tools bearing the Cincinnati trade mark. In all, there are over 300 sizes, types and styles. Yet, with all these machine tools designed and built for industries everywhere, there's nothing static about any of them. New ideas of design and methods are always in the making in Cincinnati Milling's engineering and research departments.

We are sure that new Cincinnati machine tools to come will help provide higher standards of living for everyone, and give them greater opportunity to enjoy the blessings of life.

The Season's Greetings to you, from The Cincinnati Milling Machine Co., and Cincinnati Grinders Incorporated.

Report from Peoria...on Big-Gear

Caterpillar
REG. U. S. PAT. OFF.

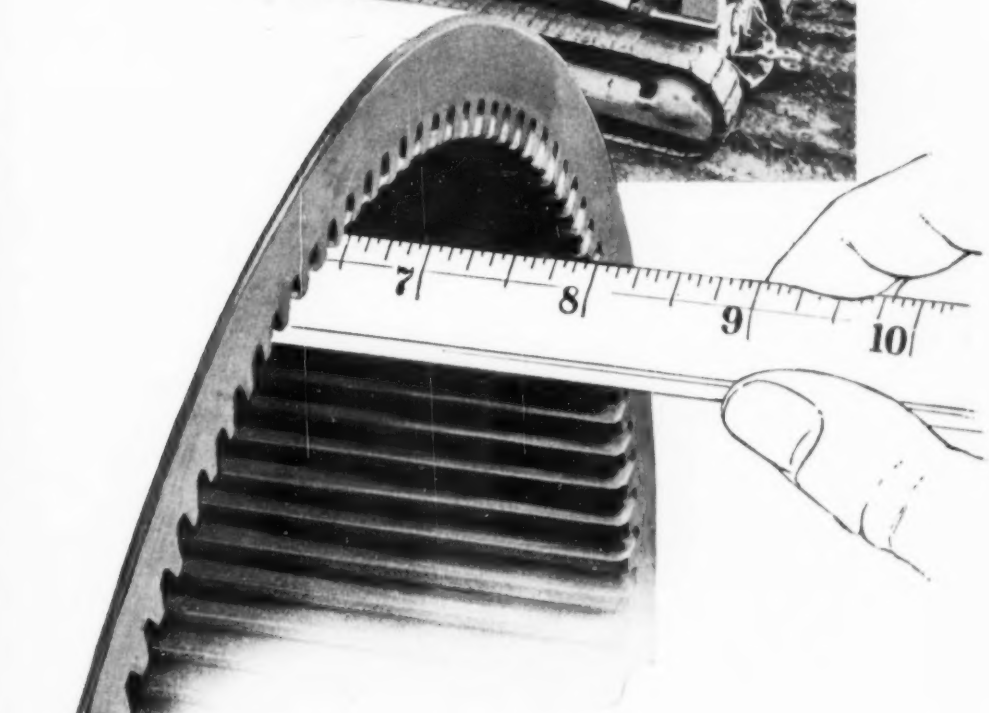
selects Fellows 36-Type Gear Shapers, at its Peoria Plant, for high production on unusually wide-face steering clutch drum gears for its Track-type Tractors and No. 6 Shovels.*

**Specially arranged for 8" face-width; standard face-width capacity is 6".*

Time-study Performance: Internal C.I. Gear with 128 8-pitch teeth of 8 inches face width – ACTUAL CUTTING TIME, 29.339 MINUTES. Finished in one cut with Gear Shaper operating at 50 strokes per minute, .0408" rotary feed.

THE *Fellows*

Cutting

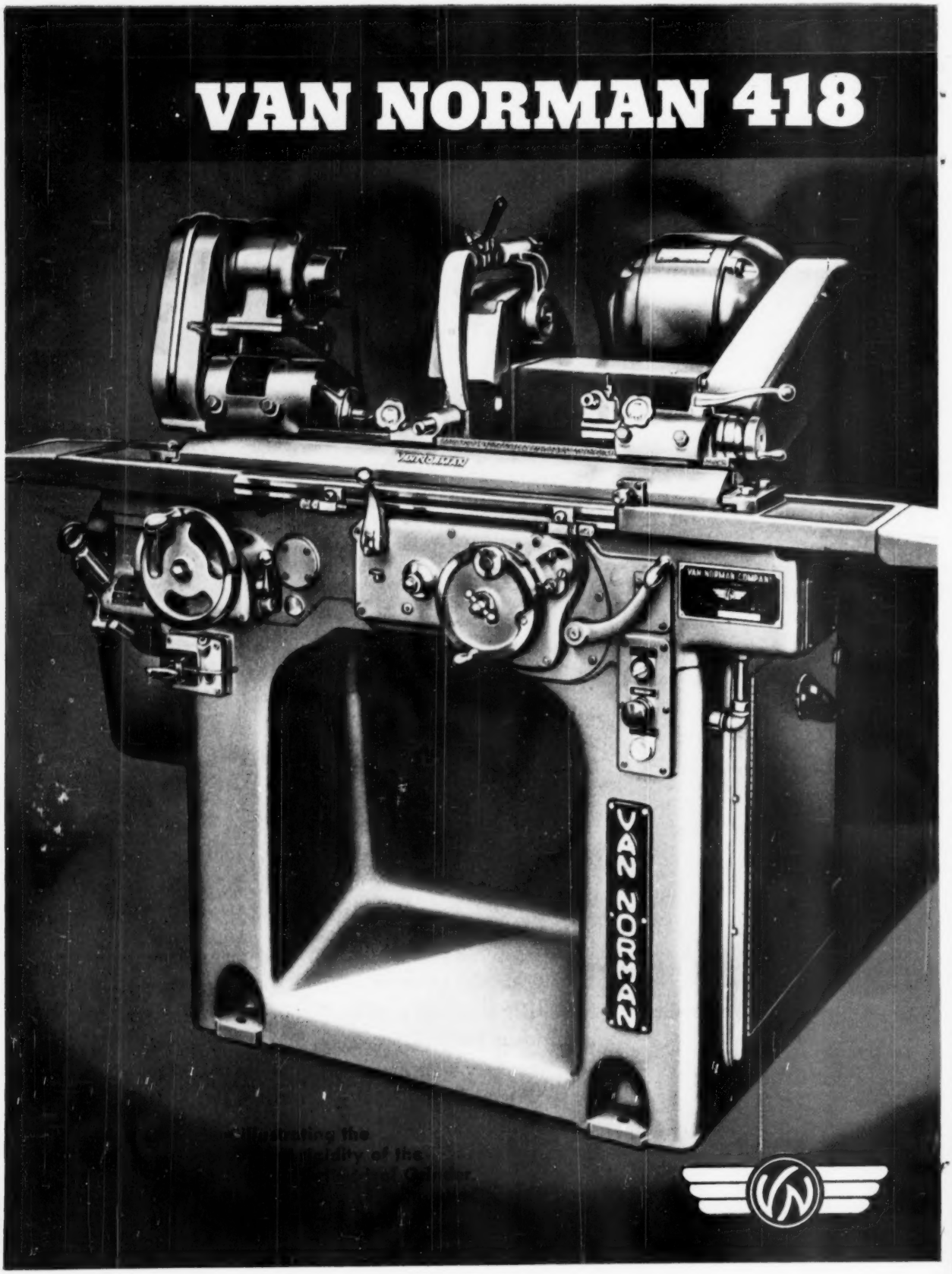


The heavy-cut, high-speed capacity of the 36-Type Fellows Gear Shaper makes it a profitable investment wherever quality work is to be turned out on a low cost basis.

Shift-lever and dial controls save set-up and operating time. Choice of 12 cutter-spindle speeds and 12 rotary feeds. Big machine rigidity throughout holds work to traditional Fellows precision. Rated for work up to 36″ diameter; spur or helical involute gears; cams or other irregular shapes. *Write for details.*

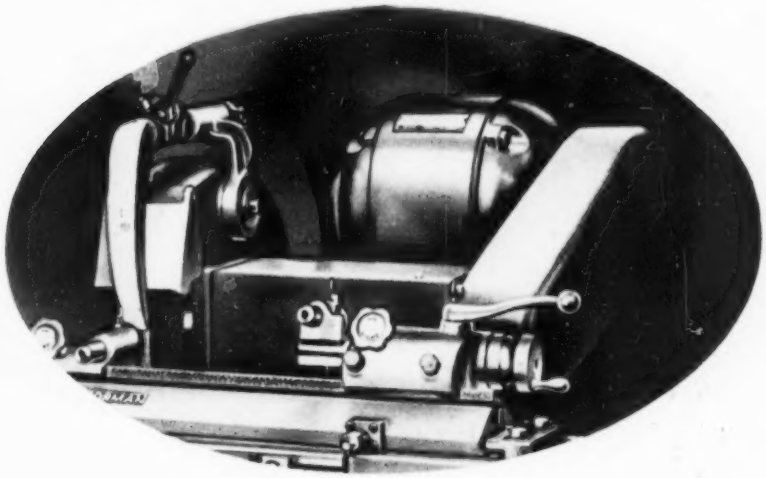
GEAR SHAPER COMPANY

Head Office and Export Department: 78 River Street, Springfield, Vermont.
Branch Offices: 323 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39.
2206 Empire State Building, New York.


VAN NORMAN 418
VAN NORMAN COMPANY

CYLINDRICAL GRINDER

Engineered for Fast, Economical "Close-Tolerance" Plunge or Traverse Grinding of Small Parts



Grinding unit designed for maximum accuracy and long life. Pope wheel spindle equipped with heavy-duty, extra-large SKF double-row cylindrical roller bearings, assures smooth chatter-free finish.

The Van Norman 418 Cylindrical Grinder is completely engineered from base to bearings to give heavy machine performance. It is particularly adaptable for economical grinding in toolrooms, job shops or plants where work is usually in small or medium runs. Controls are conveniently grouped for ease of operation.

Write for bulletin giving complete details. Especially inquire about the price. It's exceptionally low for a quality grinder.

OTHER VAN NORMAN FEATURES

- Heavy-duty headstock and footstock for rigidity, accuracy and smooth grinding
- Single lever control for rapid traverse and plunge grinding
- Automatic starting and stopping of headstock and table traverse
- Rugged base, wide table bearing ways, separate motor drives for wheel spindle, table and headstock
- Floor space needed, only 43¼" x 79¼"

VAN NORMAN COMPANY, SPRINGFIELD 7, MASS.

LARGE CASING

THE LANDIS Machine CO.

• • • THE WORLD'S LARGEST MANUFACTURERS OF

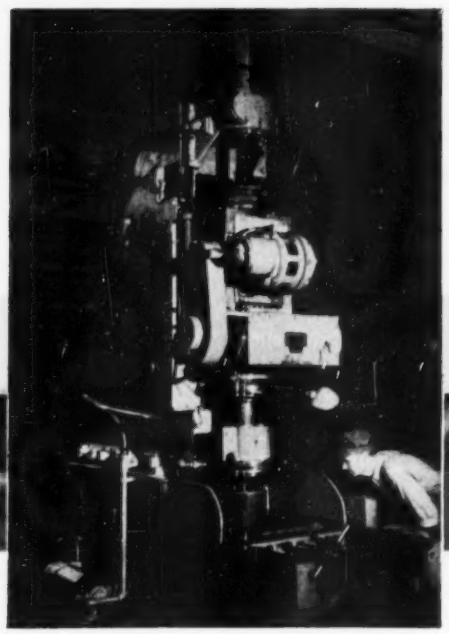
3746

THREADS TAPPED IN 12 MINUTES...

BAKER OIL TOOLS, INC., of Los Angeles, California, reports that a *LANDIS* CBLM Circular Chaser Tap mounted on a Stamet's vertical tapping machine has reduced threading time 75%, tapping 6⅝" to 13⅜" diameter threads in casing shoes.

Production examples illustrate the large savings made in threading time: (1) tapping 13⅜" N-80 tubular stock, oil well casing shoe with 8 Pitch API round threads 5" long requires but 12 minutes; (2) tapping a 6⅝" piece with an 8 pitch API round thread 5" long takes only 8 minutes. Formerly, threading a typical casing shoe would have required all of 40 minutes.

The *LANDIS* CBLM Tap, as used at Baker, is designed for use on production tapping machines to thread line pipe, casing, and drill pipe couplings. The tap head is detachable, and with the use of the various size tap heads available, the CBLM Tap will tap threads ranging from 4½" to 13⅜" O.D. It will cut either 3/16", ⅜", or ¾" tapered threads well within all API Standards, and can also be arranged for straight threading. Infinite taper adjustments are possible either above or below the required degree of taper to assure precision accuracy.



LANDIS manufactures a wide variety of taps for the economical production of internal threads ranging from 1¼" to 13⅜", either straight or tapered threads, on both stationary and rotating spindle machines. To ensure complete information, please enclose specifications when writing.

50th ANNIVERSARY

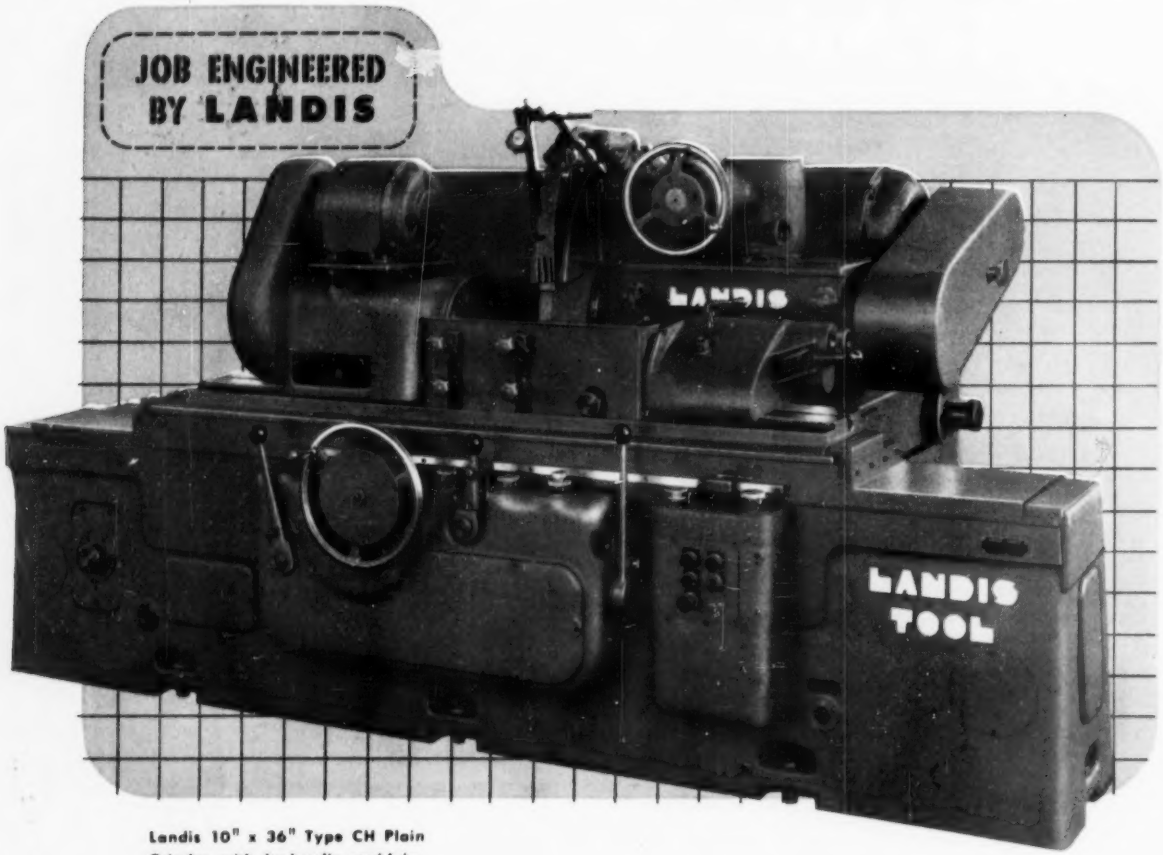
LANDIS

WAYNESBORO PENNSYLVANIA

THREAD GENERATING EQUIPMENT

How LANDIS JOB ENGINEERING cuts grinding costs . . .

Automatic Grinding Cycles Reduce Operating Costs . . . Give Better Quality—Sustained High Production



Landis 10" x 36" Type CH Plain Grinder with hydraulic rapid infeed and sequence grinding feeds.

JOB ENGINEERED by LANDIS means grinding ideas that will make your modernization or replacement program pay off. It starts with operator convenience, hydraulic controls and simplified maintenance of a standard Landis grinder. Then, on the basis of your requirements of finish, tolerance and production, we will suggest tooling that will reduce the operating costs of your grinding department.

Landis Job Engineered Grinders give you a fast return on your investment because they're engineered to *your* requirements. Send us prints for tooling and production estimates. No obligation.

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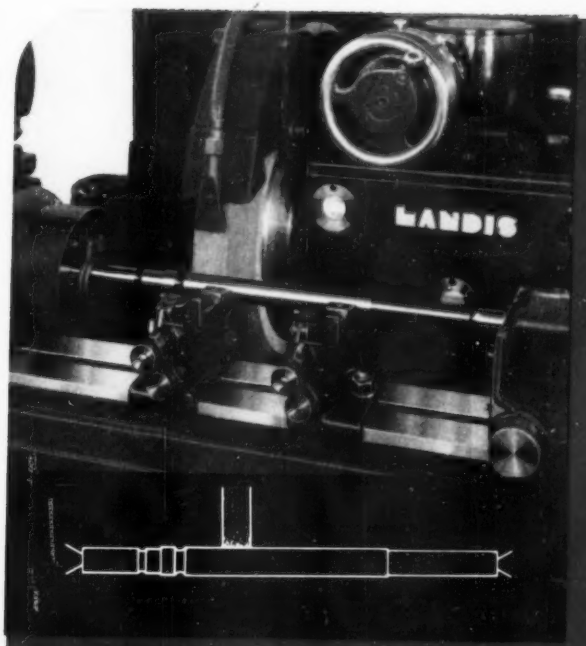
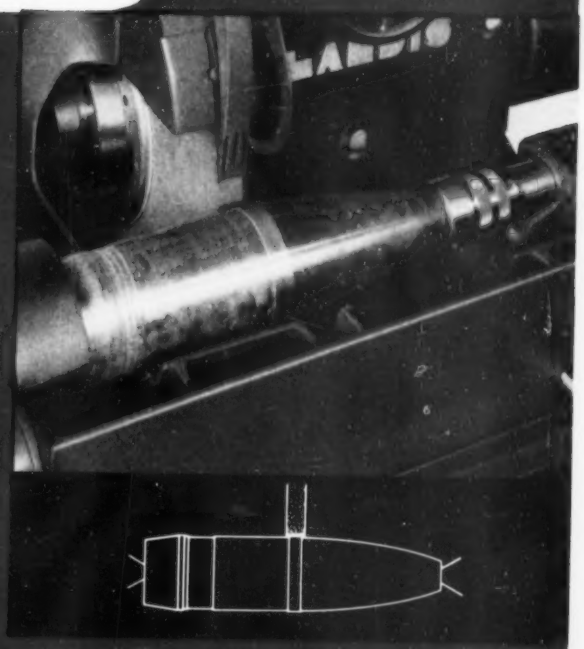
LANDIS

precision grinders

JOB ENGINEERED BY LANDIS

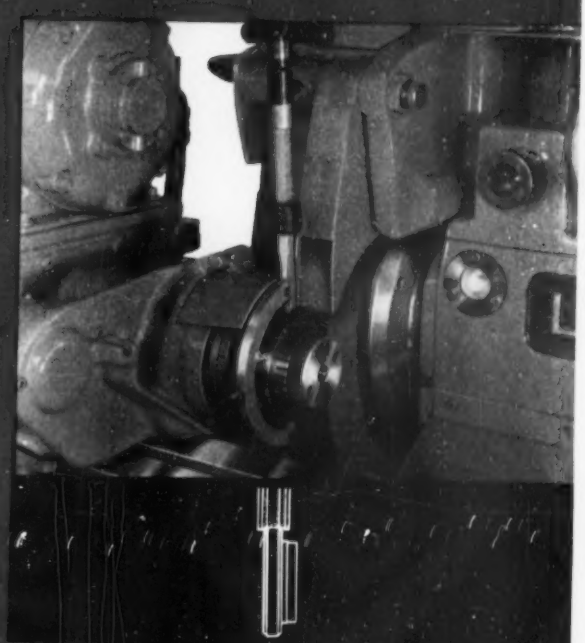


TRAVERSE GRINDING with adjustable wheel feed, at each or either reversal point, to finish size. Feed automatically re-sets.



INFEED GRINDING WITH TIMER has rapid advance of wheelhead and adjustable continuous grinding feed with timed spark-out. Automatic re-set of wheelhead and feed.

SEQUENCE GRINDING FEEDS for grinding side walls with a different feed rate than used on diameters. All feeds re-set at end of cycle.



AUTOMATIC SIZING combined with weight-lever feed grinding. Sizing device retracts wheelhead when finished size is reached. Feeds re-set automatically.

LANDIS TOOL COMPANY • WAYNESBORO, PENNSYLVANIA, U. S. A.

Dual personality...

with one idea in mind—profit!

Both metal hog, and tolerance miser — this versatile machine's only goal is turning out better work faster. It's the G&L 350-T Horizontal Boring, Drilling and Milling Machine

HERE'S how this ultra-precision, 30 Series table-type machine helps you increase boring, drilling and milling efficiency. First of all, its open construction and rigidity allow you to handle either large or small work with equal precision on a production or custom run basis.

Furthermore, it's exceptionally versatile. Take the helicopter rotor hub job, illustrated at left, as an example. Here a 350-T helped produce a complex 250-lb. finished part from 3000-lb. forging . . . yet maintained tolerances to .0007"!

It's this kind of capacity, versatility and precision that helps you not only handle your current work more profitably . . . but also gives you extra capacity to handle future work requirements.

For complete details on this 5" spindle, 25-hp machine — or for information on all G&L quality-built Horizontal bars with 3-4-5-6 or 7" spindles; in table, floor or planer types — contact your G&L representative or write —

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer type; Hypro Double Housing and Openside Planers, Planer Type Milling Machines; Vertical Boring Mills; and Davis Cutting Tools

Photo courtesy of Magna Mill Products, South Gate, Calif.

VK HIGH SPEED STEEL THREAD MEASURING WIRES

...basic tools in a universally accepted method of checking screw threads

VK Set No. 20 HS Thread Measuring Wires, accurate to ±.000025" for 20 common pitch Unified and American screw threads, 6 to 36 threads per inch.

The three-wire method is probably the best known and most widely accepted system of measuring pitch diameter of screw threads. Equipment required includes only a set of VK Thread Measuring Wires of proper diameter and an accurate measuring instrument.

Van Keuren Thread Measuring Wires have been developed over a period of many years of pioneering in the precise measurement field. They are made to National Bureau of Standards specifications, are held within .00002" for roundness, straightness and identity and to within .000025" of exact size.

VK Thread Measuring Wires are made of long-wearing, tough and beautifully finished high speed steel and are either 1⅞" or 2" in length. Every wire is subjected to the closest criteria in today's standards of accuracy.

In addition to set No. 20, shown here, VK furnishes many other standard sets as well as special wires in diameters from .001" to 1.500."

The Van Keuren Catalog and Handbook No. 35 contains 91 pages of technical and engineering information on wire measurement of screw threads. This information, compiled from many years research in the field, is available without charge by addressing: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

VK

34th YEAR

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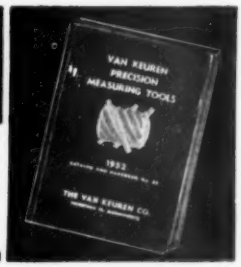
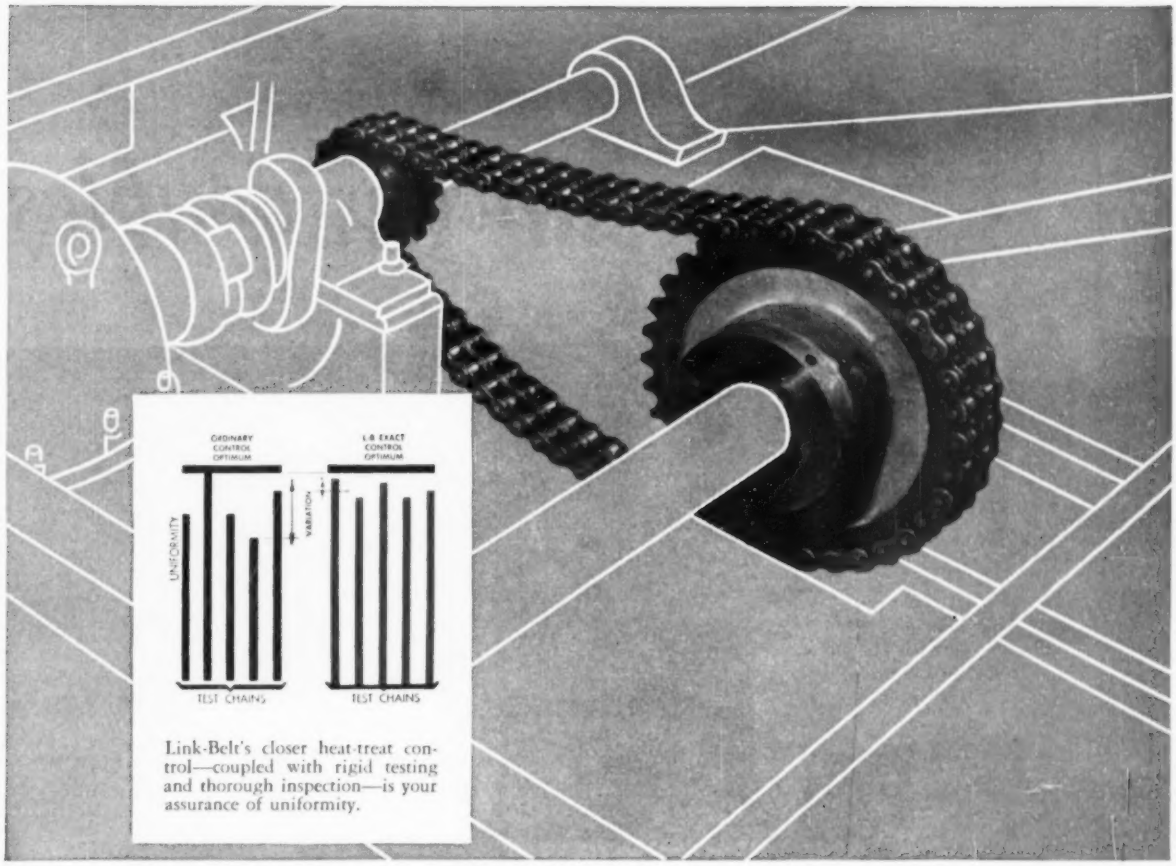
173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages





Link-Belt's closer heat-treat control—coupled with rigid testing and thorough inspection—is your assurance of uniformity.

Closer heat treat control means longer roller chain life!

But it's only one of many engineering extras you get from LINK-BELT

THE long-life record of Link-Belt Precision Steel Roller Chain is based on more than closer heat treat control. Consider such extra-wear features as shot-peened rollers and lock-type bushings. They're further assurance of Link-Belt's *built-in* extra life.

Link-Belt Roller Chain is available in single or multiple widths, ⅜" through 3" pitch. Double pitch, 1" through 3". For all the facts, call the Link-Belt office or distributor near you today, or write for Data Book No. 2457.

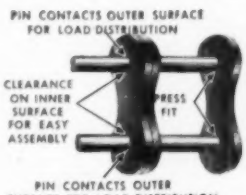
LINK-BELT

ROLLER CHAIN & SPROCKETS

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities. 13.129-A

Don't overlook these other LINK-BELT extras

Shot-peened rollers have extra fatigue life for higher speeds, heavier loads.


PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION
CLEARANCE ON INNER SURFACE FOR EASY ASSEMBLY
PRESS FIT
PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION

Couple, uncouple multiple-width chains easily.

Lock-type bushings assure free articulation.

Once again!...

Jacobs doubles

production rate—gets the

"TOUCH of GOLD"

Leading chuck manufacturer uses Norton machines to cut grinding time in half

When a leader like The Jacobs Manufacturing Company selects equipment, you can be sure that this equipment has had careful study from every angle of performance and cost.

That's why Jacobs' choice of Norton grinding machines is worth serious consideration when *you* are buying grinding machines.

In producing their famous Rubber-Flex Collets, for example, Jacobs reports that switching from separate operations to a single operation on Norton Type CTU Semiautomatics with multi-wheel mounts has doubled their production rate. *Jacobs reported similar production savings in grinding chuck bodies on the same type of Norton machines.*

Another manufacturer has boosted production from 300 to 600 parts per hour by grinding 2 diameters at once on a Norton machine. Still another reports that a Norton grinding machine with a triple-wheel mount has upped his production rate 128%. Throughout industry, manufacturers are using Norton grinders and lappers to provide the "Touch of Gold" that means time, work and money saved in grinding operations.

The "Touch of Gold" in Your Own Grinding

means the same profit-increasing advantages. And remember: only Norton offers you such long experience in both grinding wheels and machines to assure this "Touch of Gold" that helps you produce more at lower cost.

For further facts, see your Norton Representative, or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize With NEW

NORTON

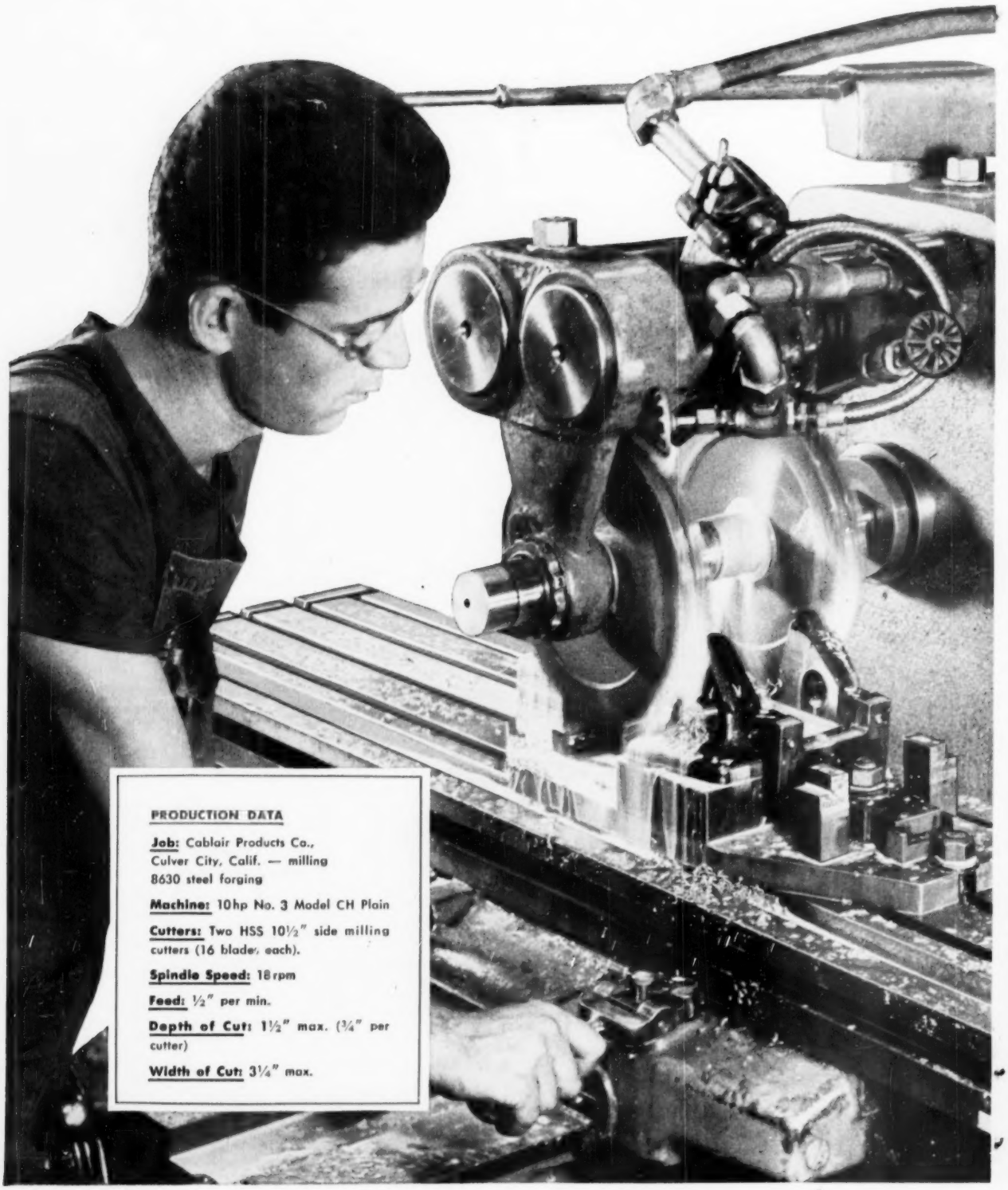
GRINDERS and LAPPERS

Making better products... to make other products better

District Sales Offices: West Hartford • New York (Teterboro, N. J.) Cleveland • Chicago • Detroit

The "Touch of Gold" at Jacobs. One of the Norton 6" Type CTU Semiautomatic Grinding Machines used by The Jacobs Manufacturing Company of West Hartford, Connecticut, to grind metal inserts in the famous Rubber-Flex Collets. The basically fast action of this Norton grinder, the multi-wheel mount, special swivel table arrangement and wheel-truing device provide a single setup for traverse and shoulder grinding operations that boosts production rate 100%.

Getting right speed



PRODUCTION DATA

Job: Cablair Products Co., Culver City, Calif. — milling 8630 steel forging

Machine: 10 hp No. 3 Model CH Plain

Cutters: Two HSS 10½" side milling cutters (16 blades each).

Spindle Speed: 18 rpm

Feed: ½" per min.

Depth of Cut: 1½" max. (¾" per cutter)

Width of Cut: 3¼" max.

selection for tough forgings—

no problem with a CH machine!

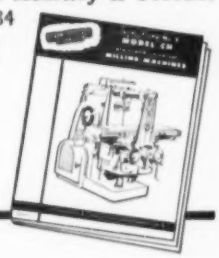
• This Kearney & Trecker No. 3CH 10 hp Milling Machine mills 100 steel forgings between cutter grinds. Previous average was only 18 pieces!

Milling tough steel forgings might have presented a difficult production problem if this manufacturer had not owned a versatile No. 3CH miller. Tough material, the necessary speeds and size of cut combined to produce excessive cutter wear. An average of only 18 pieces could be machined before cutters had to be reground. This situation, unremedied, would have seriously restricted output and increased costs.

However, the CH miller's design provides a wide range of 24 spindle speeds (15 to 1500 rpm). By utilizing this feature, and selecting an appropriate coolant, the manufacturer *increased cutter life by over 500%!* Today, uninterrupted runs of 100 pieces are average.

This case is only one of hundreds where CH design features provide the versatility to easily meet common as well as unusual machining problems.

For details on Kearney & Trecker CH machines, contact your representative or write to Kearney & Trecker Corporation, 6784 West National Ave., Milwaukee 14, Wis., for illustrated brochure.



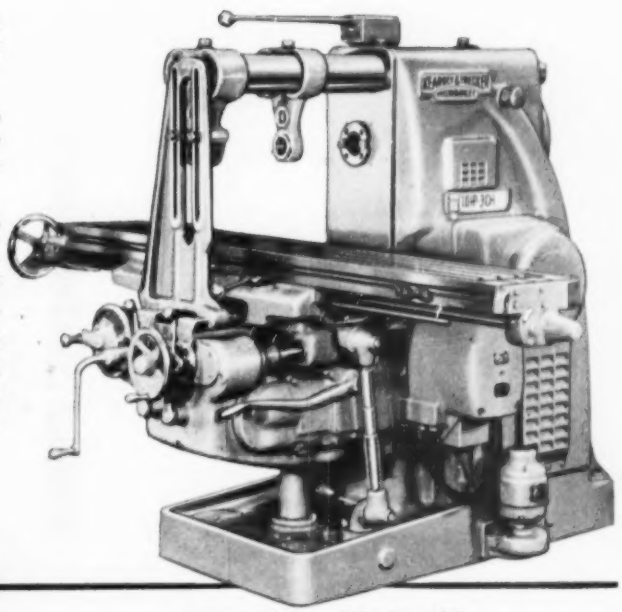
Check these important CH features

Extra wide feed range — 32 changes from ⅜" to 90" per minute meet requirements of new metals and cutting tools.

Greater rigidity — entirely new column . . . heavily ribbed, box section, sponson construction . . . absorbs vibration from heaviest cutting loads.

Smoother feed performance through a heavy duty 2" dia. table feed screw. Extra large bronze nut provides greater bearing contact for longer screw life and backlash elimination.

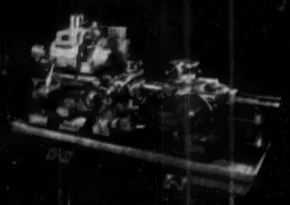
Greater horsepower through independent drives for spindle, feed and rapid traverse, and coolant. 10 hp delivered to spindle . . . 3 hp for feed and rapid traverse . . . ¼ hp for coolant.



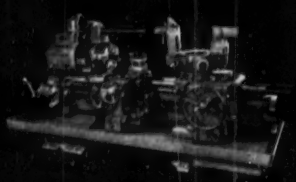
Kearney & Trecker 10 hp No. 3CH Milling Machine.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

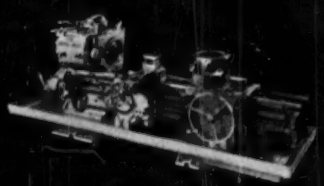
TURRET LATHES | **RAM TYPE ▸ ▾ SADDLE TYPE**



1-A UNIVERSAL HEAVY DUTY
2½" or 3" Bar Capacity — 16¼" Swing



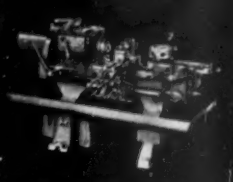
2-A UNIVERSAL HEAVY DUTY
3½" Bar Capacity — 20" Swing



3-A UNIVERSAL HEAVY DUTY
4½" or 6" Bar Capacity — 23½" Swing

4-A UNIVERSAL HEAVY DUTY
8", 9" or 12" Bar Capacity — 28¼" Swing

NO. 2 ALL-GEARED HEAD
1" Bar Capacity — 14" Swing



NO. 3 UNIVERSAL
1½" Bar Capacity — 15⅜" Swing

Get the competitive edge for the years ahead...

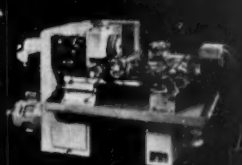
by planning a continuing modernization program

Look to the company that is constantly analyzing modern trends in metalworking to better fulfill the needs of industry by developing new types and sizes of machines — extending its Sales Engineering facilities to be of even greater service.

Look to your Warner & Swasey Field Engineer as your "turning specialist". He can help you select the right machine, and will continue to *share your interest* in its performance in the years ahead.

ELECTRO-CYCLES

NO. 1 ELECTRO-CYCLE
⅝" Bar Capacity — 11" Swing

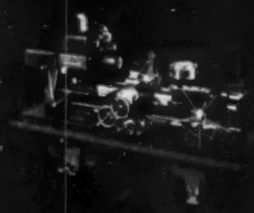


NO. 2 ELECTRO-CYCLE
1" Bar Capacity — 14" Swing

YOU CAN TURN IT BETTER, FASTER, FOR LESS WITH WARNER

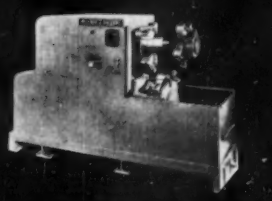
PRECISION TAPPING AND THREADING MACHINES

NO. 4 UNIVERSAL
2" Bar Capacity—18⅛" Swing

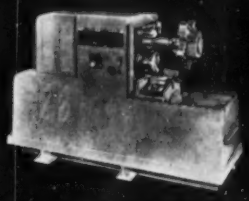


NO. 5 UNIVERSAL
2½" Bar Capacity—20" Swing

SINGLE SPINDLE AUTOMATICS



1 AC CHUCKING MACHINE
8" or 10" Chuck—6" Working Stroke

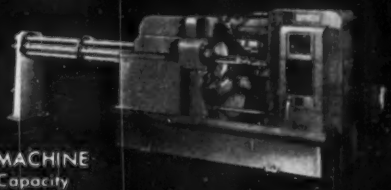


2 AC CHUCKING MACHINE
10" or 12" Chuck—9" Working Stroke

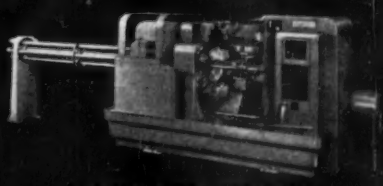
NO. 10 TAPPING MACHINE
0-80 to 10-24 Capacity

NO. 11 TAPPING MACHINE
8-36 to ⅞" Capacity

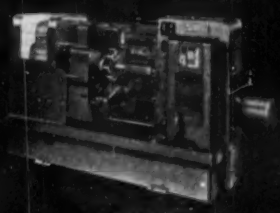
MULTI-SPINDLE AUTOMATICS



6-SPINDLE BAR MACHINE
¾" or 1¼" Bar Capacity



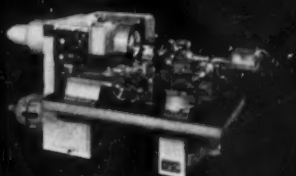
5-SPINDLE BAR MACHINE
1¾" Standard Bar Capacity
2¼" Oversize Capacity



5-SPINDLE CHUCKING MACHINE
6" Swing

NO. 11 RS RADIAL (Single Head)
NO. 11 RD RADIAL (Double Head)
8-36 to ⅞" Capacity

NO. 12 TAPPING MACHINE
⅜" to 2½" Capacity



NO. 3 ELECTRO-CYCLE
1½" Bar Capacity—15⅜" Swing

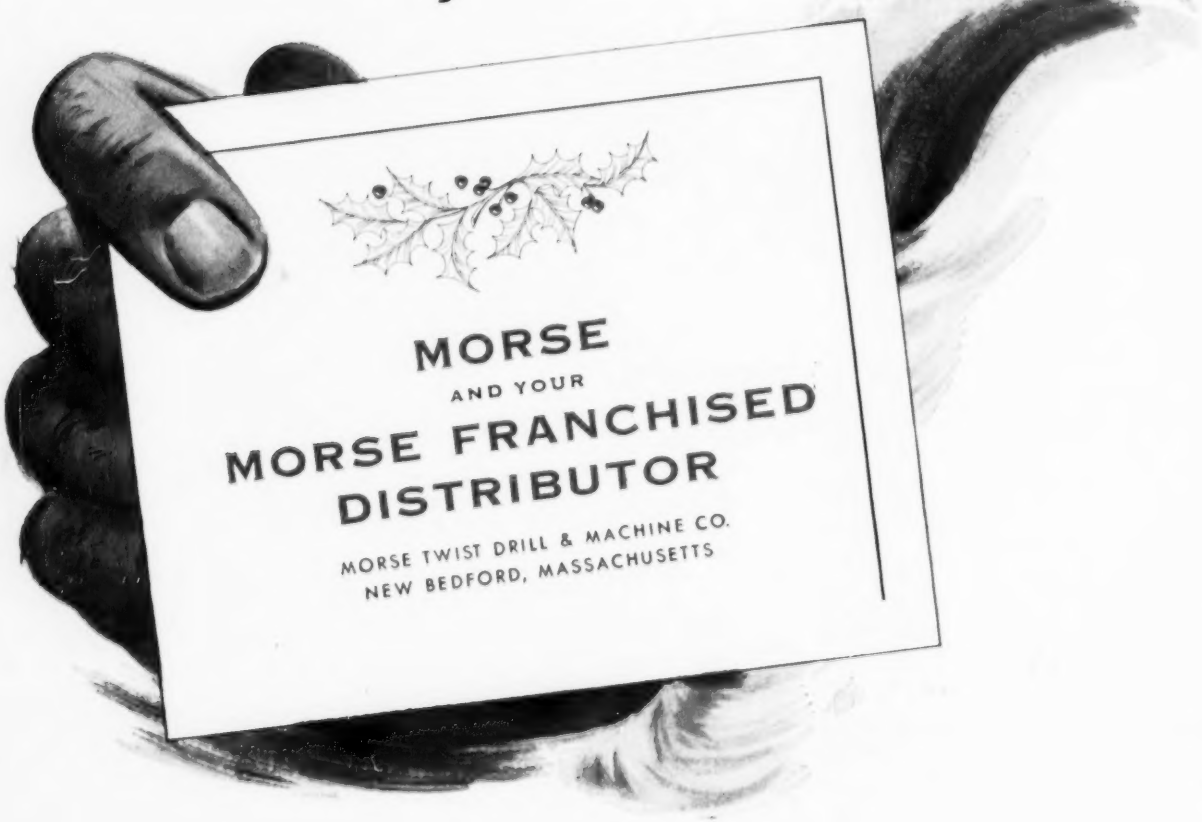
16" ELECTRO-CYCLE
1½" Bar Capacity—16⅞" Swing

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

& SWASEY TURRET LATHES, AUTOMATICS, TAPPING MACHINES

Once again...our merry, mutual friend brings you

Best Wishes for Christmas and the New Year from



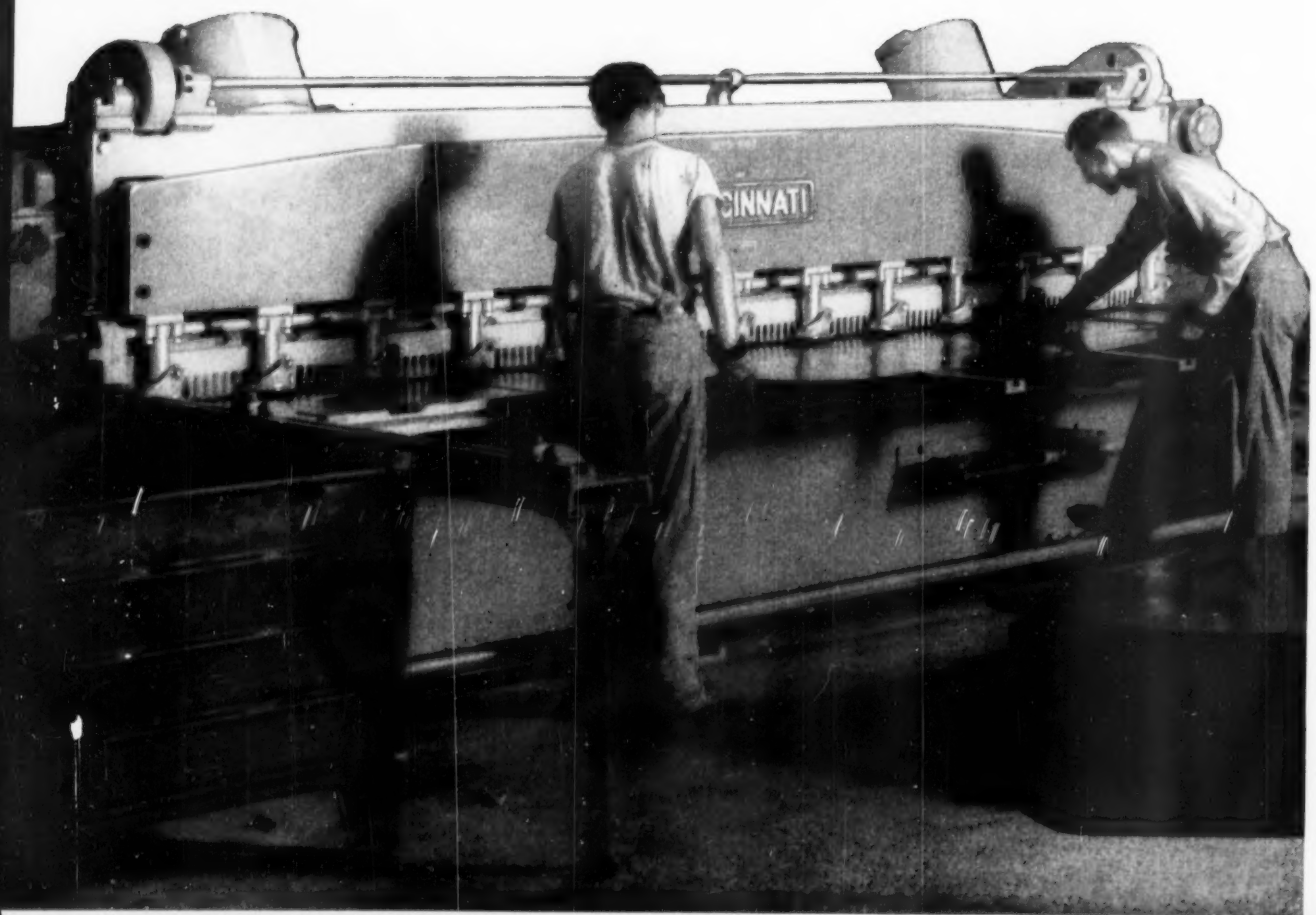
Ventilating Fan

ACCURATE BLANKS

are produced

Colonial Chime

Electric Ceiling Heater

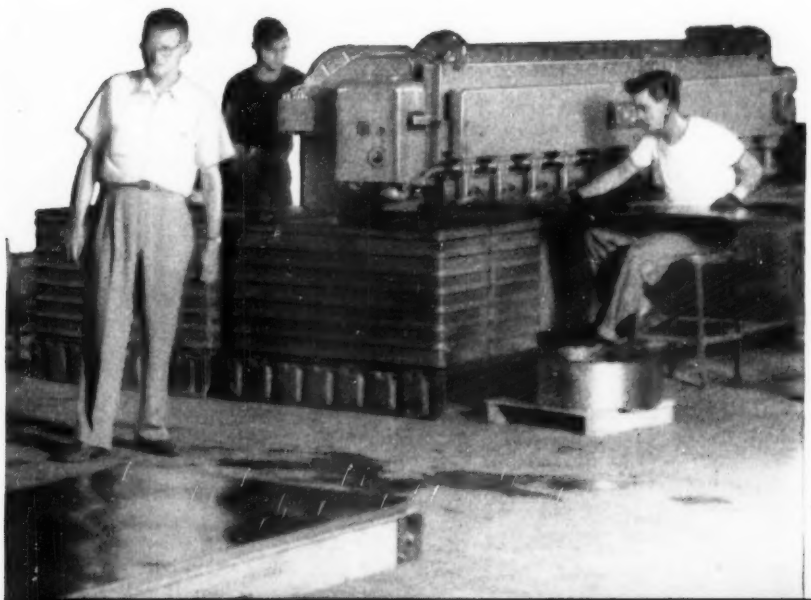


for all these products on Cincinnati Shears

Accurate blanks and strip stock of many sizes are sheared on these Cincinnati Shears at Nutone, Inc. The shearing operation eliminates costly dies, is flexible, rapid and economical.

One hundred and seventy-five tons of light sheets are sheared a month. Press operations are speeded and spoilage is at a minimum. The flexibility of the shearing operations take care of new products or changes in design with no tooling or special costs. Investigate these accurate Shears.

Write for catalog S-6.



Photos courtesy
Nutone, Incorporated,
Madison and Red Bank Roads,
Cincinnati 27, Ohio

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

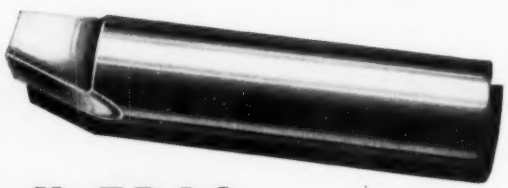
A T R A X

is for ATRAX . . . the finest of cutting tools.

is for TOUGH . . . they're *solid tungsten carbide.*

is for RIGHT . . . they're precision ground-from-the-solid.

is for ACTION . . . when Atrax tools solve difficulties in your production line.



is for X-TRAS . . . Atrax tools give with longer service, less trouble, better profits.

Representatives and Distributors in principal cities in United States and Canada. Write for name of representative in your area.

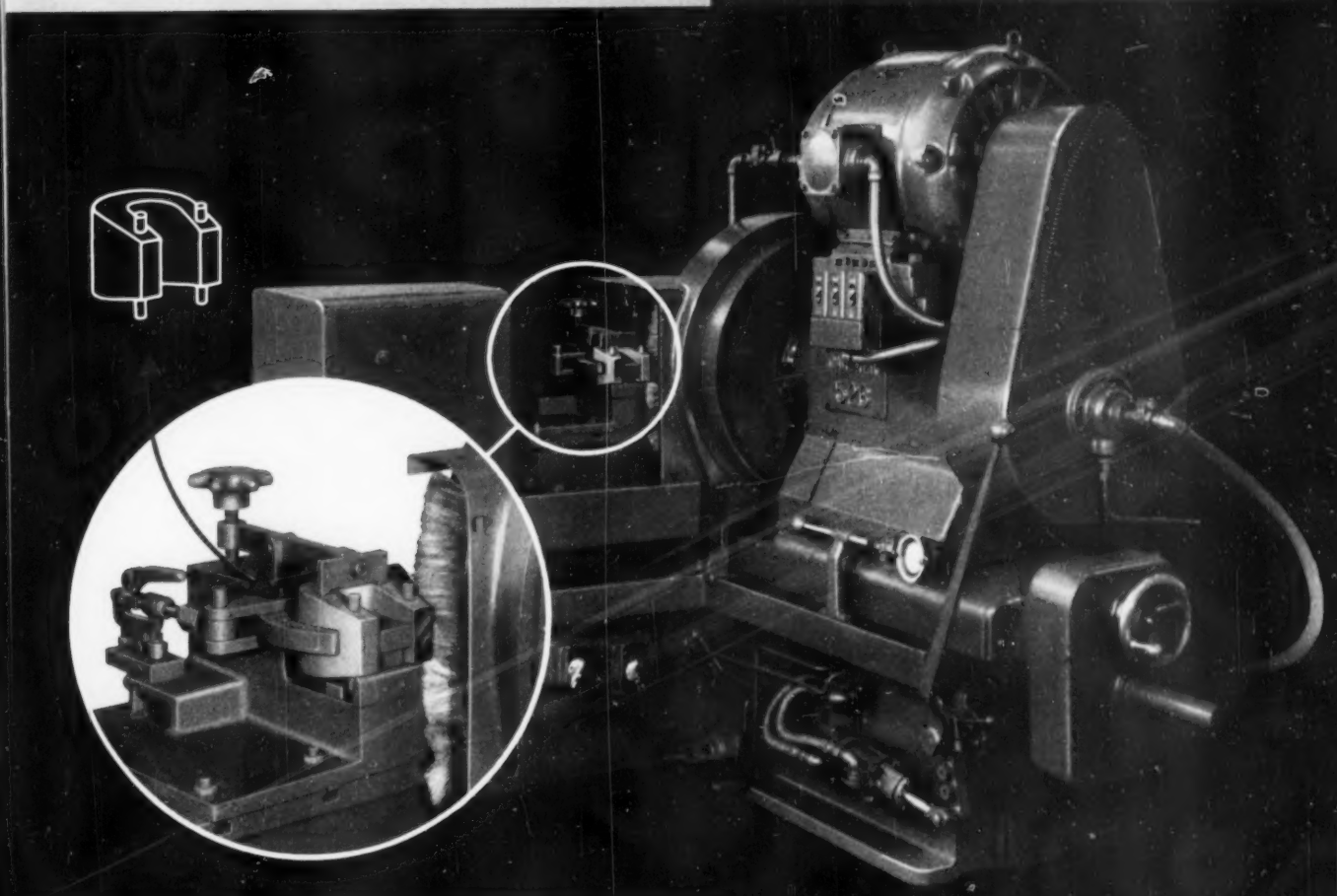
Send for complete catalog NOW!

THE ATRAX COMPANY

NEWINGTON 11, CONNECTICUT

This 26" Single Spindle Grinder with hydraulic table finishes the poles of large U-shaped Alnico magnets in half the time of the surface grinding method formerly employed.

Gardner Grinding Doubles Production



No. 127M

WORK DATA

MACHINE	Gardner No. 526—26" Single Spindle Grinder
TOOLING	Hydraulically-operated work table with hand clamping fixture
PART	Alnico horseshoe magnet with 5 sq. in. pole area
STOCK REMOVAL	Up to 1/16"
TOLERANCES	.0005" to .001" for flatness .010" for uniformity
PRODUCTION	25 magnets per hour

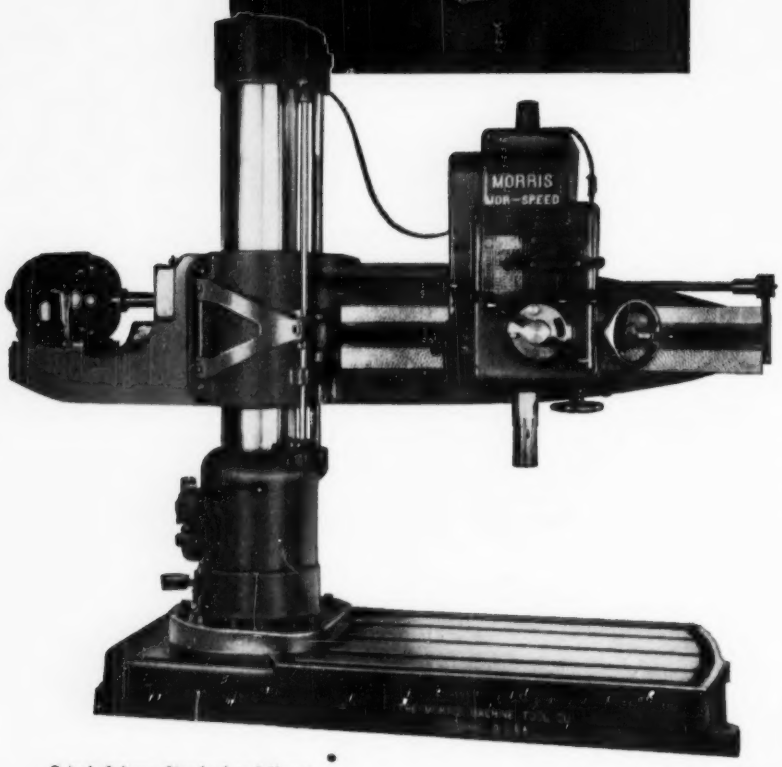
GARDNER MACHINE COMPANY
410 Gardner St., Beloit, Wisconsin, U.S.A.

GARDNER
Precision Disc **Grinders**

get speed...
safety...
accuracy...
with

MORRIS

MOR-SPEED
RADIAL DRILLS



completely centralized controls...

On a MORRIS Mor-Speed Radial Drill every control is in sight . . . within reach . . . easy to operate fumble free!

The operator makes speed, feed and other adjustments, quickly and easily—concentrates on job, rather than on bending, stepping, stooping or reaching for awkward controls. A wide selection of automatic stops and trips cut time per operation to a minimum. Carefully designed, tested safety devices assure complete protection to machine, operator and work. Alloy steels, modern hardening methods and anti-friction bearings . . . at every wear-vulnerable point . . . plus constant lubrication for all operating parts, protect and maintain precision and make Mor-Speed Radials capable of higher production over longer periods of time.

Find out how MORRIS Mor-Speed Radial Drills can make precision work possible and profitable for you, even under your heaviest scheduling demands.

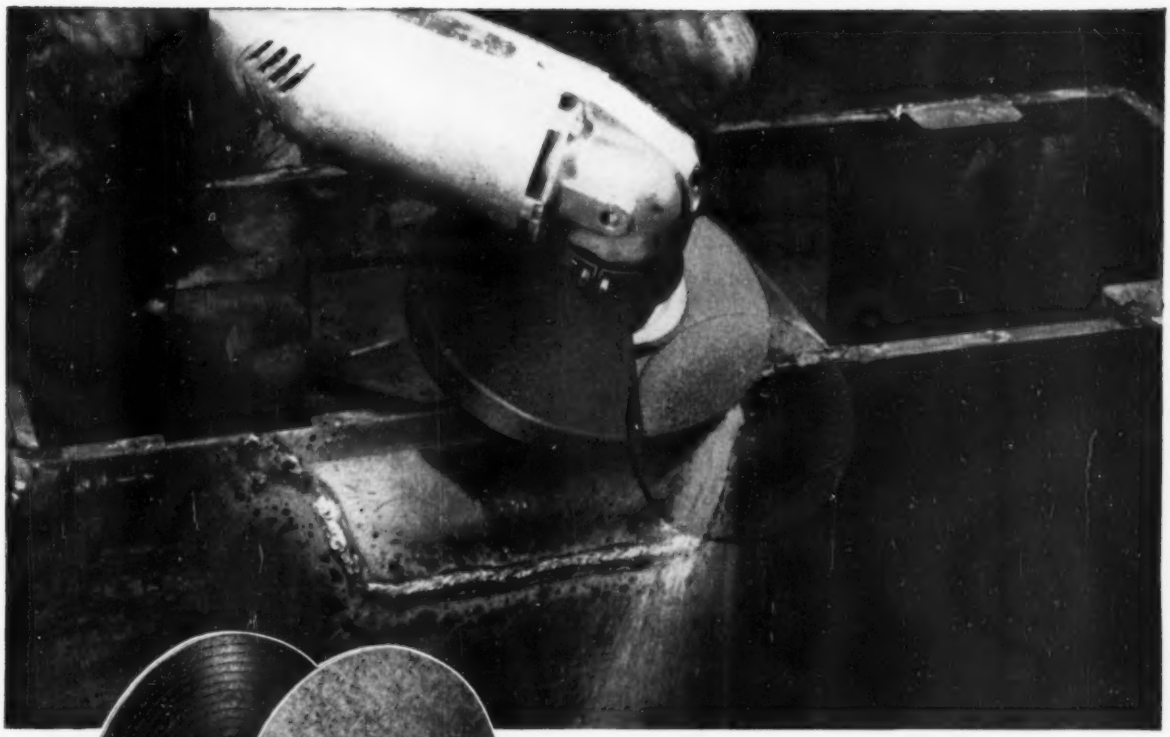
WRITE FOR BULLETIN NO. 59
Early delivery dates available.

THE MORRIS MACHINE TOOL COMPANY
933 HARRIET ST., CINCINNATI 3, OHIO

- 9-inch Column Standard and Heavy Duty models with 3 and 4-foot arms.
- 11-inch Column Heavy Duty models with 3, 4, 5, and 6-foot arms.

a better product at less cost —with precision PLUS production

Morris



Always the top weld grinding wheels, the new Norton Reinforced Hub Wheels — the Rigid BD and the Semi-Flexible BFR — now accentuate the profit-building "Touch of Gold" with greatly improved performance.

NOW...better than ever!

New improvements in Norton BD and BFR wheels for weld grinding add greater value to the "TOUCH of GOLD"

The story behind the new Norton BD (Rigid) and new BFR (Semi-Flexible) Reinforced Hub Wheels is a striking example of Norton's never-ending product development.

Already top performers over the widest range of weld grinding jobs, these two popular wheels have been re-designed for even greater popularity. Advantages like the following tell you why:

The rigid BD wheel. A new outside layer of cutting material enables the BD wheel to cut on both sides — and to start cutting the instant it touches the work, eliminating the need for "breaking-in." In addition, increased strength and durability and faster cutting action make it the ideal weld grinding wheel for heavy stock removal. It is also excellent for notching gates and risers on castings.

The semi-flexible BFR. New construction provides greater durability, for longer service life, plus faster cutting rates. Other features for stepped-up performance include: more uniform grinding action from wheel to wheel and lot to lot; stronger bonding and improved cutting-off action. Combining fast cutting with safety, the BFR is unequalled for your lighter weld grinding applications.

This new "Touch of Gold" is job-proved

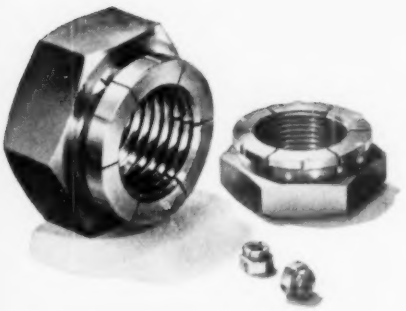
In field test after field test, these stronger, faster-cutting BD and BFR wheels have outlasted and outperformed the best that competition can offer. So, once again you have the famous Norton "Touch of Gold" in action — producing better results and cutting costs in the grinding jobs *you're* doing right now. For complete facts, see your Norton Distributor. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed in your classified phone directory under "Grinding Wheels." *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W—1528

NORTON
ABRASIVES

Making better products... to make other products better

PHILADELPHIA TRANSPORTATION COMPANY, Philadelphia, Pa., uses FLEXLOC Self-Locking Nuts on the rear axle flanges of its buses. This carrier has found that FLEXLOCs eliminate sheared studs, reduce maintenance, save time and money.



How FLEXLOC locknuts work

FLEXLOCs lock and stay put on a threaded member regardless of the vibration encountered. Here's how they work. The slotted top or locking section is divided into six equal, flexible segments, closed in to make the inside diameter of the nut smaller than that of the companion bolt. When the FLEXLOC is applied, these are expanded by the bolt. The spring tension of the resilient segments locks the nut securely at any desired position on the bolt once the locking threads are fully engaged.

FLEXLOCs can be used over and over again. When expanded by the bolt, the locking section remains within the elastic limit of the metal. This permits the locking segments to return to their normal position, ready for reapplication to the bolt.

FLEXLOCs are one piece, all metal—nothing to assemble, come apart, lose or forget. They can be delivered in any quantity in a wide range of sizes. Stocks are carried by industrial distributors everywhere. Write for literature and samples. SPS, Jenkintown 1, Pa.

FLEXLOC®

LOCKNUT DIVISION

SPS

JENKINTOWN PENNSYLVANIA

Our Fiftieth Year : A START FOR THE FUTURE

Production Pointers from GISHOLT

GISHOLT TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your own work.

GETTING MORE WORK PER CHUCKING WITH C/F TURRET LATHE

Only One Tool Change Required for Variety of Sizes with Expert Setup

This producer's problem was one of *sizes.* How to get fast operation on chuck bodies in a variety of sizes with minimum possible tooling and changeover.

The solution is smart . . . and noteworthy. A Gisholt 1L Cross Feeding Saddle Type Turret Lathe was selected for the job. This was equipped with a 15" 3-jaw air chuck. This not only kept chucking time low, but also, by the use of adjustable serrated jaw bases, just one set of jaws sufficed for operation 1 to handle the numerous sizes of workpieces.

The quick indexing square turret on the cross slide has tools for turning, facing, chamfering, etc. These work simultaneously with tools from the hexagon turret, a time saver on any job.

Cross Feeding Turret Speeds Job

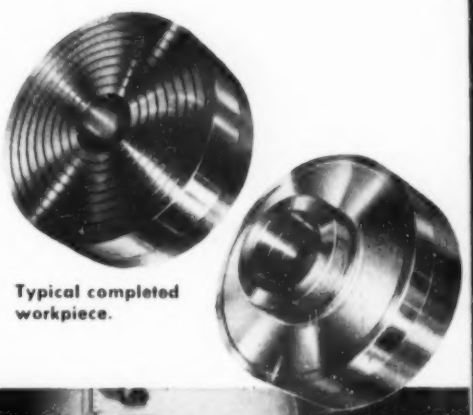
The hexagon turret is equipped with three stub boring bars for boring, counterboring, recessing or back facing. Size is set with the cross feeding turret; therefore, these same boring bars are used on many sizes of parts.

Also carried on the hexagon turret are two box-type tool posts. These are used for facing, boring or recessing. Again, because of the cross feeding hexagon turret, they are used for workpieces of various sizes.

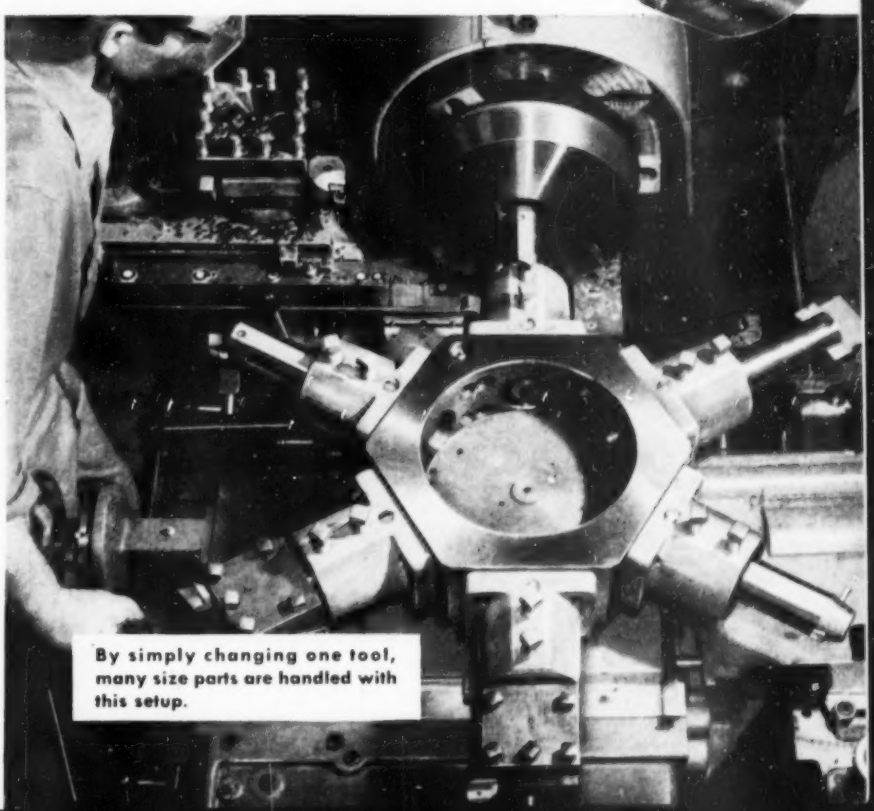
The sixth tool on the hexagon turret is a spade cutter for final sizing. This is the only tool special for each job. A quick change of this single tool readies the machine for the next job. The high production Saddle Type Turret Lathe has two additional attachments for even greater versatility. A threading attachment permits threading the hub when required. A taper attachment offers tapers up to 8 inches per foot for a wide variety of diameters.

This job shows again how you generally can do more work with fewer tools. When you specify a cross feeding turret lathe, Gisholt's 66-year experience can help you.

Simple tooling, combined with the time-saving cross feeding hexagon turret, give maximum efficiency in handling parts of various sizes.



Typical completed workpiece.



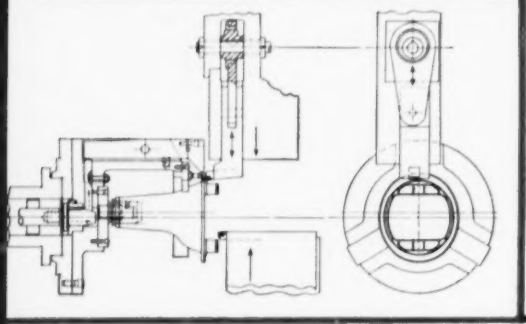
By simply changing one tool, many size parts are handled with this setup.

TIME-SAVING IDEAS

ELLIPTICAL MACHINING MADE EASY

Standard Simplimatics Solve Special Problem

Tooling layout. Note action of rear tool slide.



Circle indicates elliptical shape of workpiece.

An elliptical diameter was the stickler here. How to machine the oval shape . . . and do it on a standard machine and do it automatically?

The answer, this manufacturer found, was with the 3D Simplimatic Automatic Lathe. To do the elliptical pilot diameter on this differential carrier, a standard machine is used. Only a special cam-operated auxiliary tool, slide mounted on the standard rear slide, is required. This does both facing and turning and moves in and out two times each spindle revolution, generating the elliptical shape. When conventional facing and turning are called for, this slide is simply locked in position.

The standard front slide can be used for either facing or turning the bearing pads, merely by re-positioning at a 90° angle. Time for this part is 1.75 min. and one operator easily handles two identical machines for all production needed. Four different carriers are handled with simple changeover.

The simple addition of a special reciprocating tool slide equips standard Simplimatics for fast, automatic production of elliptical parts.

For complete picture reports on this and 30 other interesting jobs, write for new Simplimatic catalog.

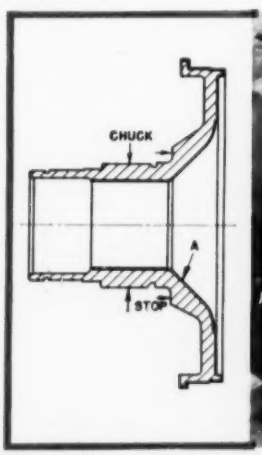
NOVEL SETUP FOR STEEP BORING

This Idea Pays Off on Ram Type Turret Lathe Job

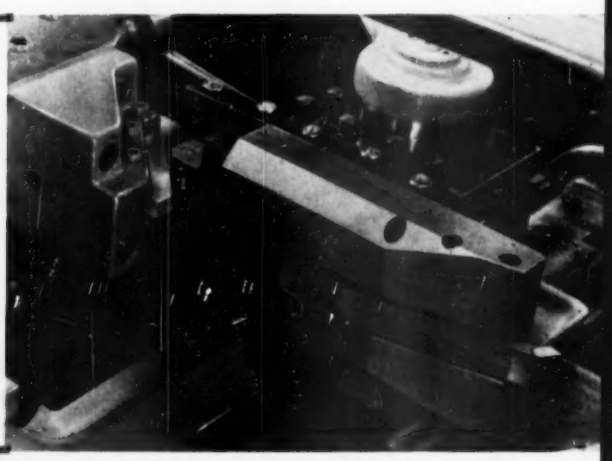
The next time you are faced with generating a steep bore similar to this, remember this production pointer.

The problem surface (see A in drawing) combines a face, radius and a 45° angular bore. Using a standard Gisholt No. 4 Ram Type Turret Lathe, a special cam is mounted on one face of the hexagon turret. On the square turret is a special spring-loaded roller slide. Here's how it's done:

Both the hexagon turret and square turret carriage are brought into position and locked. The cross slide carrying the square turret is then fed forward. As the roller on the slide tool engages the cam, the tool bit generates the interior surfaces shown. From start to finish, the job is simple. All other tooling is standard. Thus, you can handle this job—or a variety of others—quickly, economically, with very reasonable tooling costs.



The complicated interior of these rotors are generated with repetitive accuracy by the cam-guided slide tool in the square turret.



Note how sliding tool on square turret is guided by cam on hexagon turret.

GISHOLT

TIME-SAVING IDEAS

SHELL PRODUCTION...ON THE DOUBLE

No. 12 Hydraulic Lathes Enlisted for Speedy Operation

Speed was the No. 1 requirement here ... in centering and cut-off operations on 75mm. and 105mm. shells.

Here's how two different plants are pushing production using identical setups on No. 12 Hydraulic Automatic Lathes: The forgings are located from the bottom of the cavity on a mandrel and held by two sets of air-operated expanding fingers.

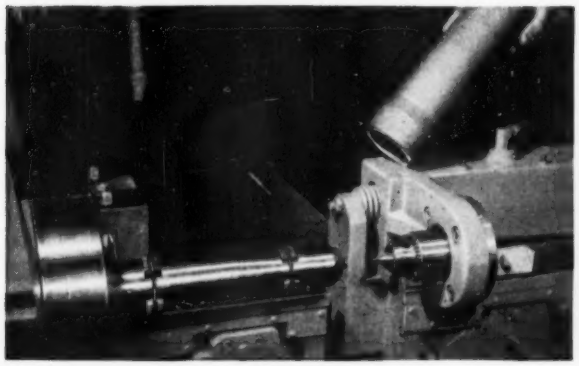
The left rear slide carries a tool block with a single tool for cut-off to length. The right slide carries an auxiliary slide on which is mounted a speeder with a center drill. The main slide moves back at the end of the cycle to clear the work for unloading.

Floor-to-floor time on the 75mm. shell (photo A) is about 0.6 minutes. Time for the 105mm. shell (photo B) is approximately 0.8 minutes. In both cases, the operators have ample time to handle two or more machines because of the automatic cycle.

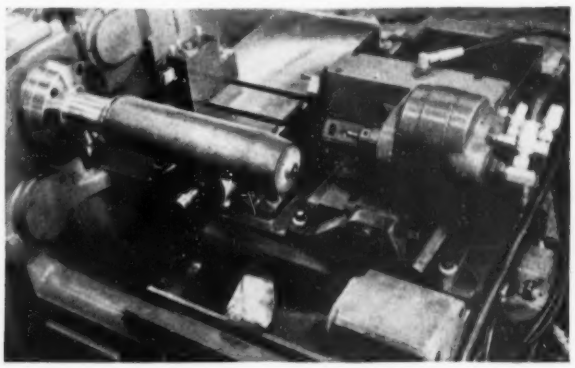
In this first machining operation, shells are faced to length . . . open end is squared . . . and proper center is established—all handled automatically, quickly and economically.

A complete catalog on the No. 12 Hydraulic Lathe is available.

(A) Close-up of No. 12 Hydraulic Automatic Lathe for work on 75mm. shell shown.



(B) Time for this 105mm. shell is 0.8 minutes.



4-MACHINE SETUP MAKES FAST WORK OF THIN-WALL PARTS

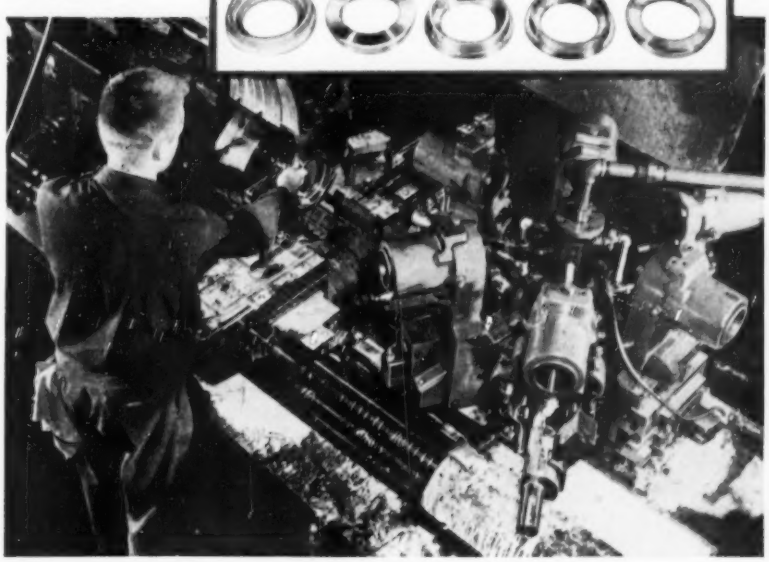
Costs are Low with one man and four Fastermatic Automatic Turret Lathes

This problem was one of accurately producing parts which require considerable stock removal, leaving them thin and frail. This precludes taking off too much metal at one time. Also, heavy chucking pressure has to be avoided to prevent distortion.

The only practical way to do it is by spreading the work over a series of relatively light cuts and doing the job automatically to keep costs low. The Fastermatic Automatic Turret Lathe, therefore, was the logical solution—with four machines handling all operations. All machines can be handled by one man since total labor time is six minutes per piece. The .004" tolerance demanded by the thin-wall section is easily met because of the Fastermatic's automatic cycle and the elimination of human error.

These thin-wall parts are accurately and economically produced by a sequence of light cuts with four Fastermatics and one man.

Rough part and after each of four operations.



Setup on one of four Fastermatics doing this job.

GISHOLT

TIME-SAVING IDEAS

HOW BALANCING PROTECTS THIS VITAL AIRCRAFT ASSEMBLY

Required Correction Shown by Direct Readings

Vibration means trouble for aircraft cabin superchargers. To insure smooth, dependable operation at high rotating speeds is this Type 13S Gisholt DYNETRIC Balancing Machine.

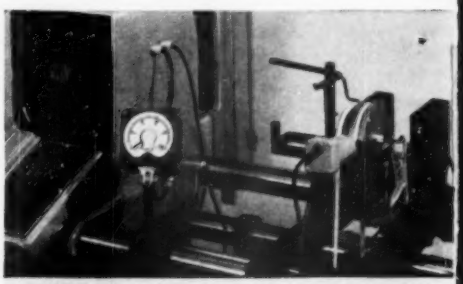
This 6-lb. assembly is supported in a cradle, rotated at 2300 r.p.m. and the amount and location of unbalance in each plane recorded. Stock is then ground off until a recheck indicates that the tolerance of .424 gram-inches has been met.

Each scale unit on the machine's direct-reading amount meter represents .1 gram-inch of unbalance. Therefore, the operator need balance to only 4.24 scale units on the meter to be within the prescribed tolerance for each correction plane. The extreme sensitivity of the machine with dial readings which provide an amplification of unbalance effect, permits greater ease and handling speed.

Whether unbalance is read in terms of stock to be removed or length of material to be added, ease of calibration is just one important feature of Gisholt Balancers.

Unbalance in terms of gram-inches is quickly measured by this Balancer with correction made by grinding off metal.

DYNETRIC BALANCERS



Simple to operate, this Balancer gives fast, accurate unbalance readings in gram-inches.

Production Balancing

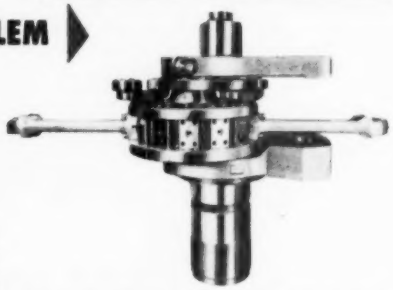
. . . is one of the many helpful subjects fully covered in the Gisholt Balancing School—only service of its kind available to industry. Write for details and starting dates . . . four classes scheduled for January and February.

SIMPLE SOLUTION TO SPECIAL CRANKSHAFT PROBLEM

Nordberg Shows How Big Job is Handled At Small Investment with Superfinishing

Superfinishing large bearing surface by means of attachment to boring mill.

No. 11-1253
614



Like many others, Nordberg Manufacturing Company solved an otherwise difficult problem through the simple expedient of Superfinishing. Extra-long bearing life is assured because Superfinish takes these critical surfaces down to base metal, removing the soft, annealed "smear metal" left by grinding heat.

The crankshafts in Nordberg Radial Engines have a *single* throw and require only two main bearings. With the force of 2125 h.p. acting on these bearings, as in the case of a 12-cyl. model, you can see the need for an accurately controlled bearing surface.

This is done at extremely low cost, both in equipment investment and in time—because of the adaptability of this modern process. Using existing equipment, a No. 3 Superfinishing Attachment is mounted in a standard tool head of a vertical boring mill. The workpiece is clamped to the rotary table in the usual manner, completing the simple setup.

Superfinishing is satisfactorily accomplished with on-hand equipment . . . without the expense of a special machine for this operation.

See how the basic advantages of Superfinishing—better, longer-wearing surfaces that cost less—can be applied to your problems. The textbook, "Wear and Surface Finish," reports fully on Superfinishing: ask for it.

With a low-cost attachment for existing equipment, these very large bearings get better, longer-lasting surfaces through Superfinishing.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Write for your copy of Gisholt's new general catalog.

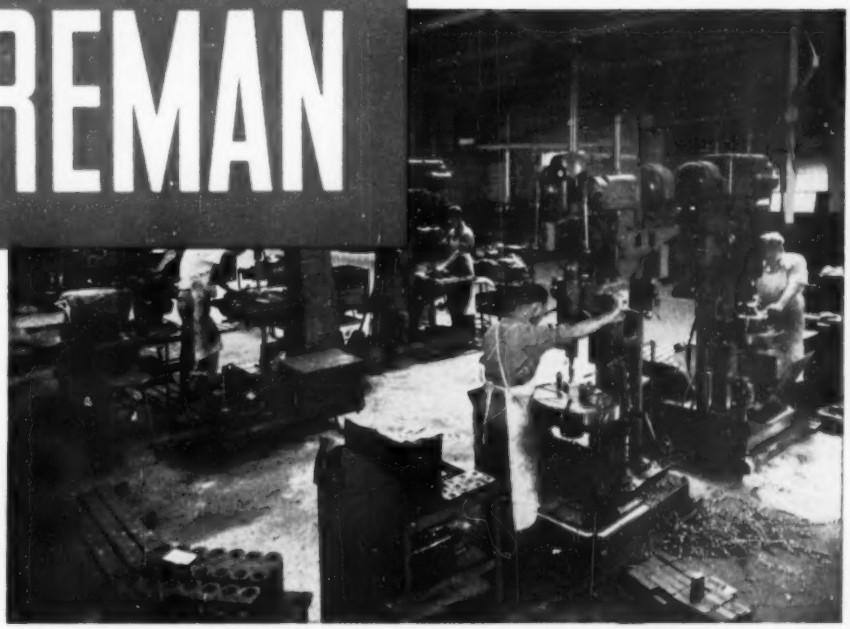
GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

CLEEREMAN

DRILLING MACHINES

A battery of box column and round column Cleereman Drilling Machines on production work. One of many such installations producing at lower costs with higher production, less operator fatigue and no down time.

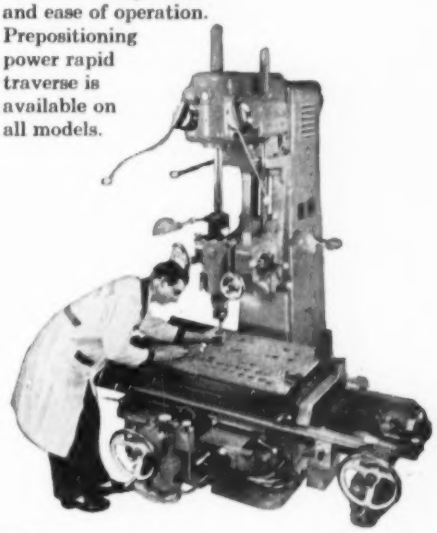


LAYOUT DRILLING MACHINE

A modern solution to an old problem. Built for those tool room and manufacturing jobs which do not require the ultra precision of Cleereman Jig Borers. The Cleereman Layout Machine is an economical machine capable of locating within .001″ per foot and drilling, boring, reaming, tapping, etc., with utmost operator ease at a fast rate of production.

JIG BORER

Unexcelled precision for ultra-fine tolerances on highest quality gage, tool, die, jig and fixture work and on "jigless" production. Combines stamina with precision and ease of operation. Prepositioning power rapid traverse is available on all models.



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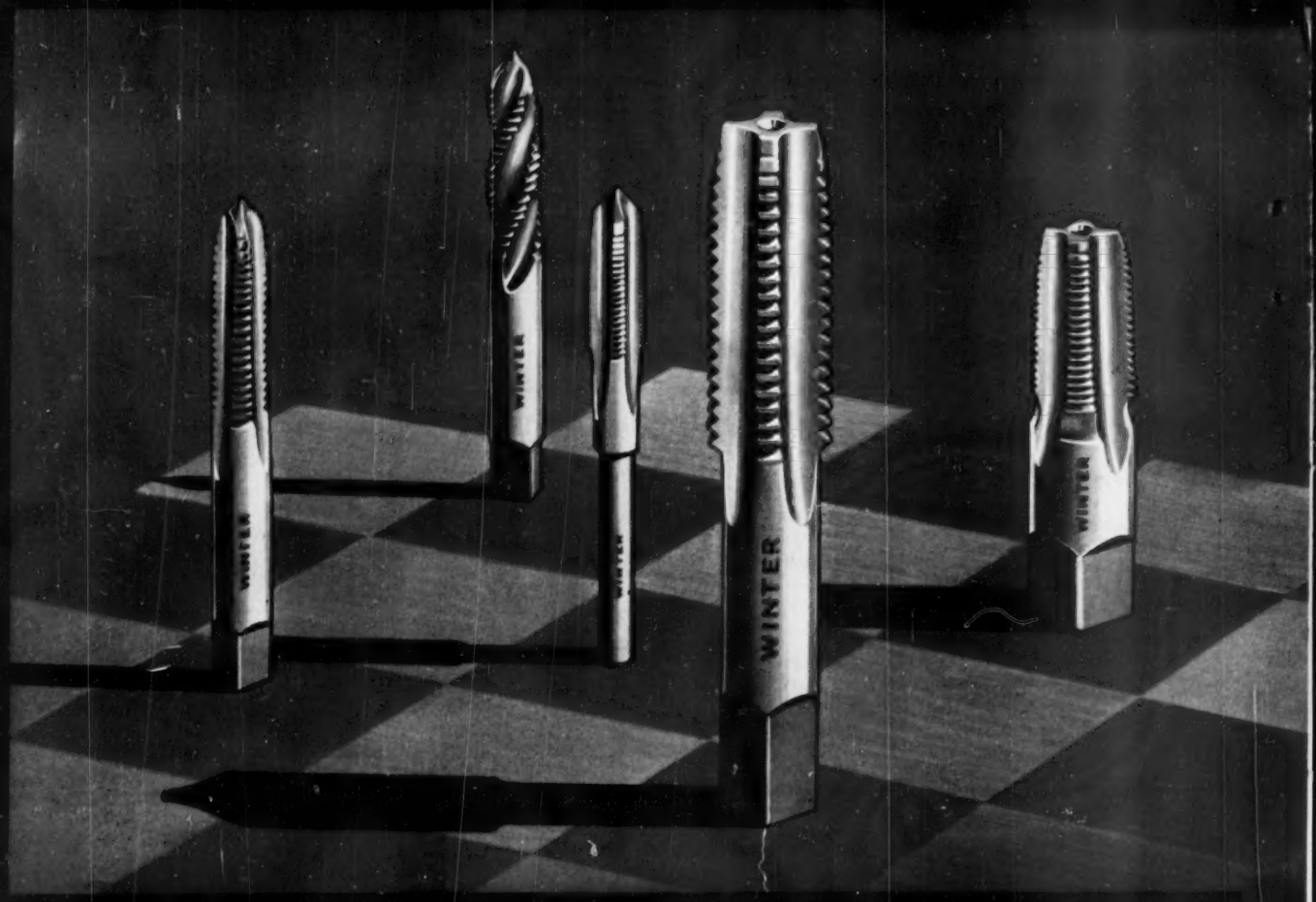
BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES



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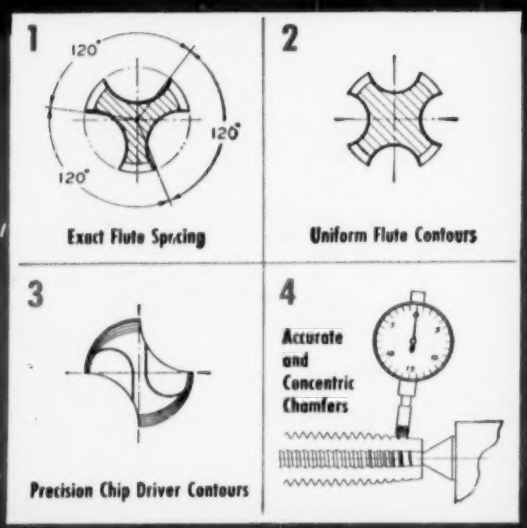

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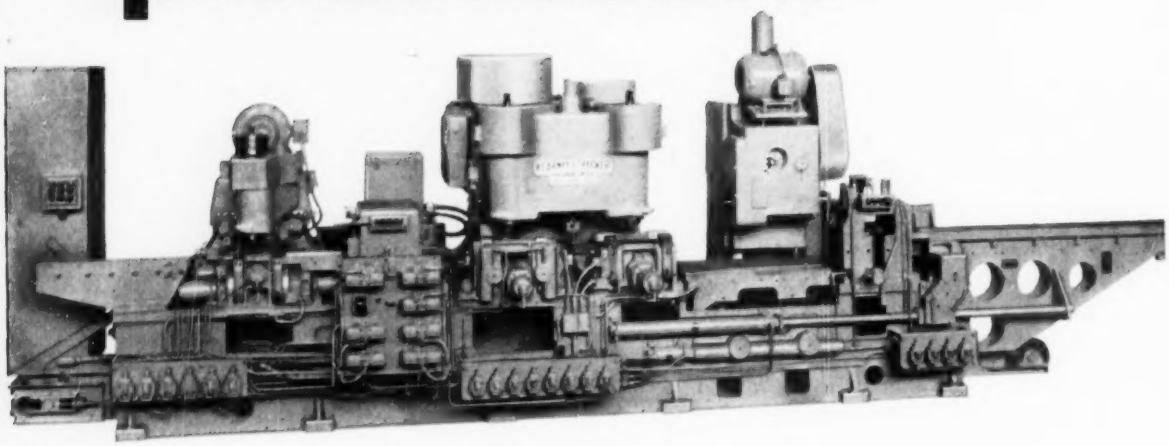

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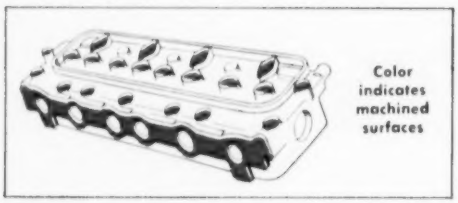
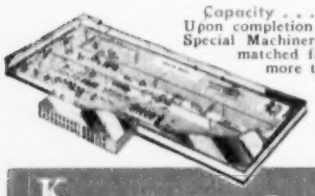
it put a one-at-a-time rough and finish milling job on a production basis!

THIS special seven-station traveling head transfer type milling machine solved an automotive manufacturer's problem that involved milling cylinder heads. Formerly, rough and finish milling of a six-cylinder head required six distinct machining operations and seven separate handlings. Now, by combining all the machining operations and eliminating handling... the special machine produces 62 finished pieces per hour.

TRAVELING HEADS . . . three heads — one with one spindle and two with three spindles. Full quill adjustment on all spindles. Speeds are fixed. Heads travel hydraulically on hardened and ground ways.



Color indicates machined surfaces



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For more details on this machine . . . ask for *Data Sheet No. 1003*. Free booklet, "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking. *Write today to* SPECIAL MACHINERY DIVISION, KEARNEY & TRECKER CORP., 6784 West National Ave., Milwaukee 14, Wisconsin.

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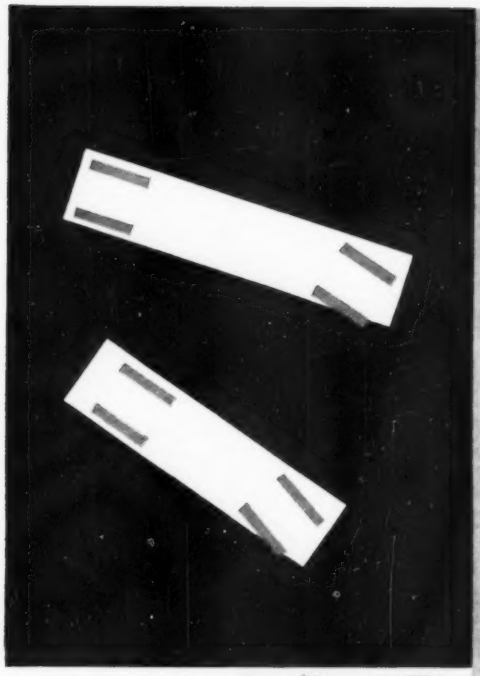
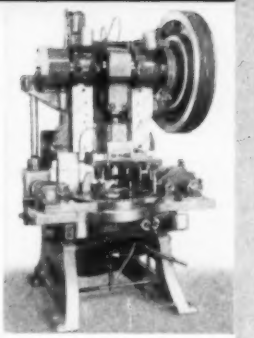
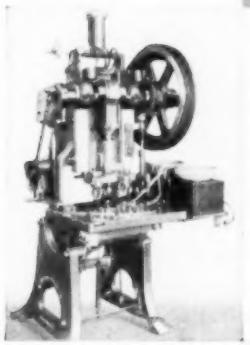


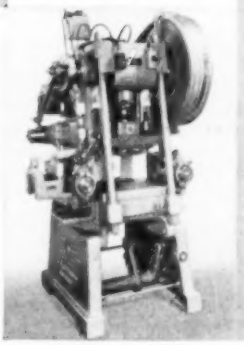
With long slide precision high speed dial operation becomes practical.





By taking advantage of long slide precision complicated dies can be fed from two or more synchronized hoppers.

Long slide versatility permits the use of multiple station progressive dies at high but sensitively adjusted speeds.



THE LONG FELLOWS STAY IN LINE

For the same reason that a long wheel base car cannot turn in the same space as a short wheel base car, a long slide on a press cannot get out of line as easily as a short slide.

▶ Long slide alignment means longer tool life: you can set up with confidence for longer runs.

▶ Long slide alignment means more precise registering of punches with dies: you can set up with confidence for higher precision runs.

▶ Long slide alignment means closer integration of tool mechanical motions: you can set up with confidence with more intricate tooling.

Ask our nearest representative. We are proud of the men who represent us.

WHY THE V & O LONG SLIDE PROVIDES BETTER ALIGNMENT

With the same running clearance, the longer the slide the less the possibility for angular misalignment. And we keep our running clearances very close indeed.

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DIVISION OF EMHART MFG. CO.

HUDSON, NEW YORK

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THE PRESS THAT WORKED ITSELF *INTO* A JOB!

This KRW 150-ton motor-driven Hydraulic Press works all day — every day — testing dies made by Phinney Tool & Die Co., Medina, N.Y. Some of these dies are small enough to fit in the palm of your hand; others weigh up to thousands of pounds.

Phinney had one interesting experience that demonstrates the amazing versatility of this Press. They received an order for a series of 4 progressive dies from a maker of tank parts. Phinney made the dies, tested them, and shipped them. A short time later the dies came back. They were excellent, but the customer didn't have a press large enough to run them. Would Phinney put the dies in production on the same Press that made the sample parts? Phinney accepted. And this same KRW Hydraulic Press has since turned out thousands of tank parts in addition to its regular work of testing dies.

You'll find the versatility and rugged construction of KRW Hydraulic Presses can save you time and money on many operations in your shop. 25-150 ton capacities; one, two or three cylinders; hand, air or motor driven. Write us for complete specifications and prices. Dep't. 11.

Maximum size Bed and Platen on 100 and 125 ton models— 40" x 60"; on 150 ton models—36" x 60".

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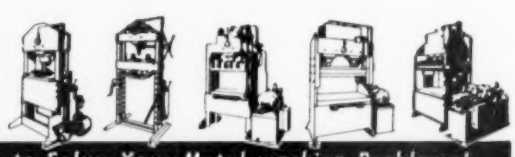

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1730 DIFFERENT CLOSE-TOLERANCE OPERATIONS including face milling, side milling, drilling, boring, counterboring, tapping and reaming were performed on the work piece shown here. No special fixtures were required and the whole job was completed . . . **IN JUST 2 SET-UPS** on a **P&W 16 INCH TILTING ROTARY TABLE!**

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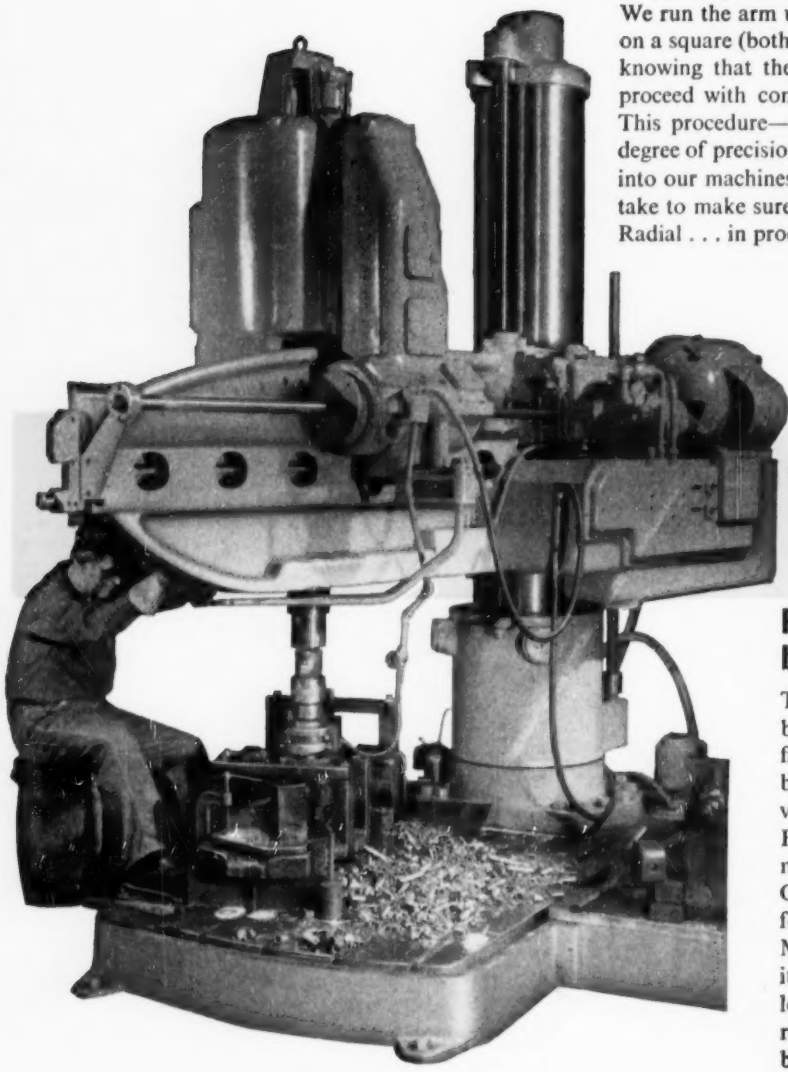
Here's another reason it pays to get a proposal from Fosdick

Fosdick aligns the column

Radial alignment at Fosdick starts with the column. We run the arm up and down with an indicator bearing on a square (both lengthwise and across the base). Then, knowing that the column is square with the base, we proceed with conventional tramming and sweep tests. This procedure—used only by Fosdick—adds an *extra* degree of precision to the extra rigidity we have designed into our machines. It's another example of the pains we take to make sure you get the most out of your Fosdick Radial . . . in production, tool life, finish, tolerance.

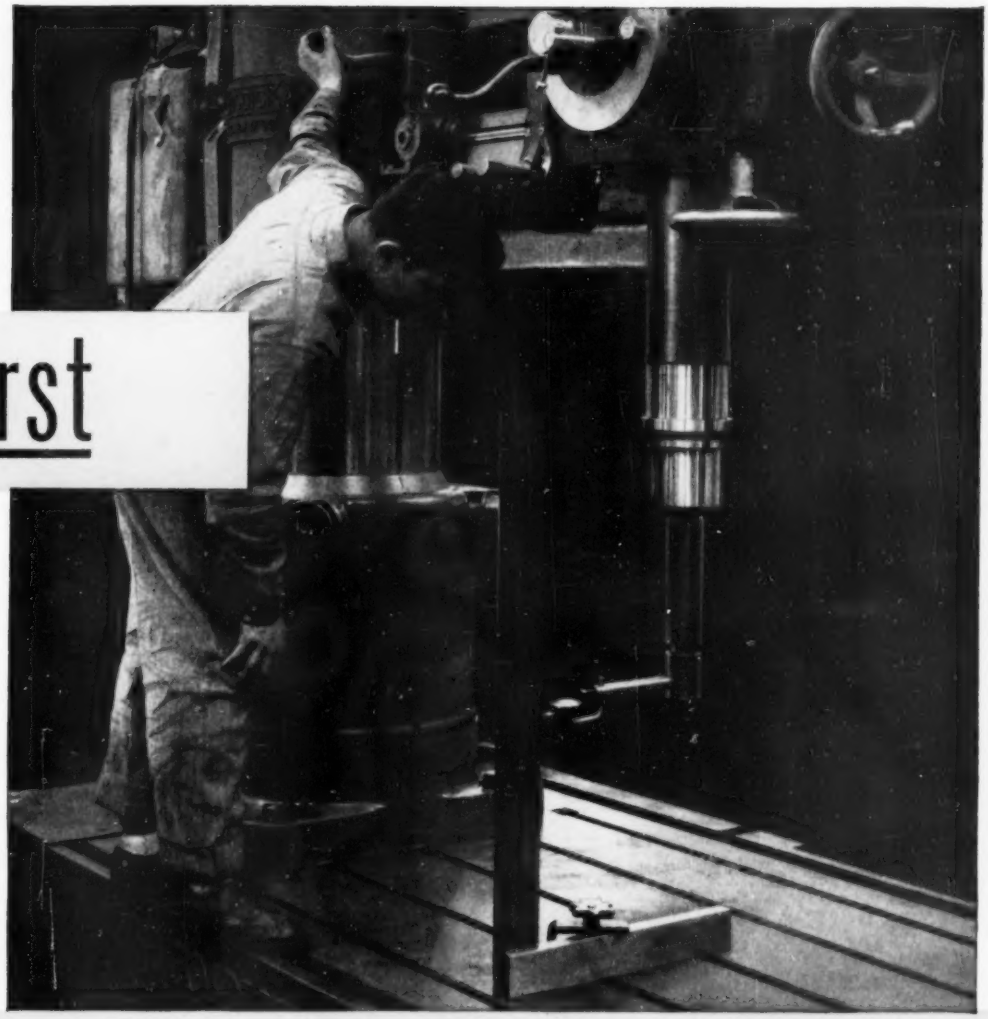
Fosdick Hydraulic Radials are available with 3' to 8' arms, 11" to 19" columns. For full information, ask for Bulletin HRA.



to give you

Fosdick takes a "bite" out of boring time at Owen Bucket

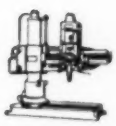
Tough cast-steel hinges for clamshell buckets are bored to ± .001" for a press-fit cast iron bushing—then counterbored for a washer. For this and a variety of other heavy-duty drilling, Fosdick's proposal on a 5' 17" Radial made sense. Now Owen Bucket Co. of Cleveland gets 10 pieces in the time formerly needed to produce 7. As Frank Matisak, General Superintendent puts it, " . . . now we can do more pieces with longer tool life—this machine is more rigid, giving us closer tolerances and better finish."



First

precision production like this

Need Drilling Equipment? Get a Proposal from Fosdick!



Radial Drills

Jig Borers

Sensitive and Upright Drills

Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

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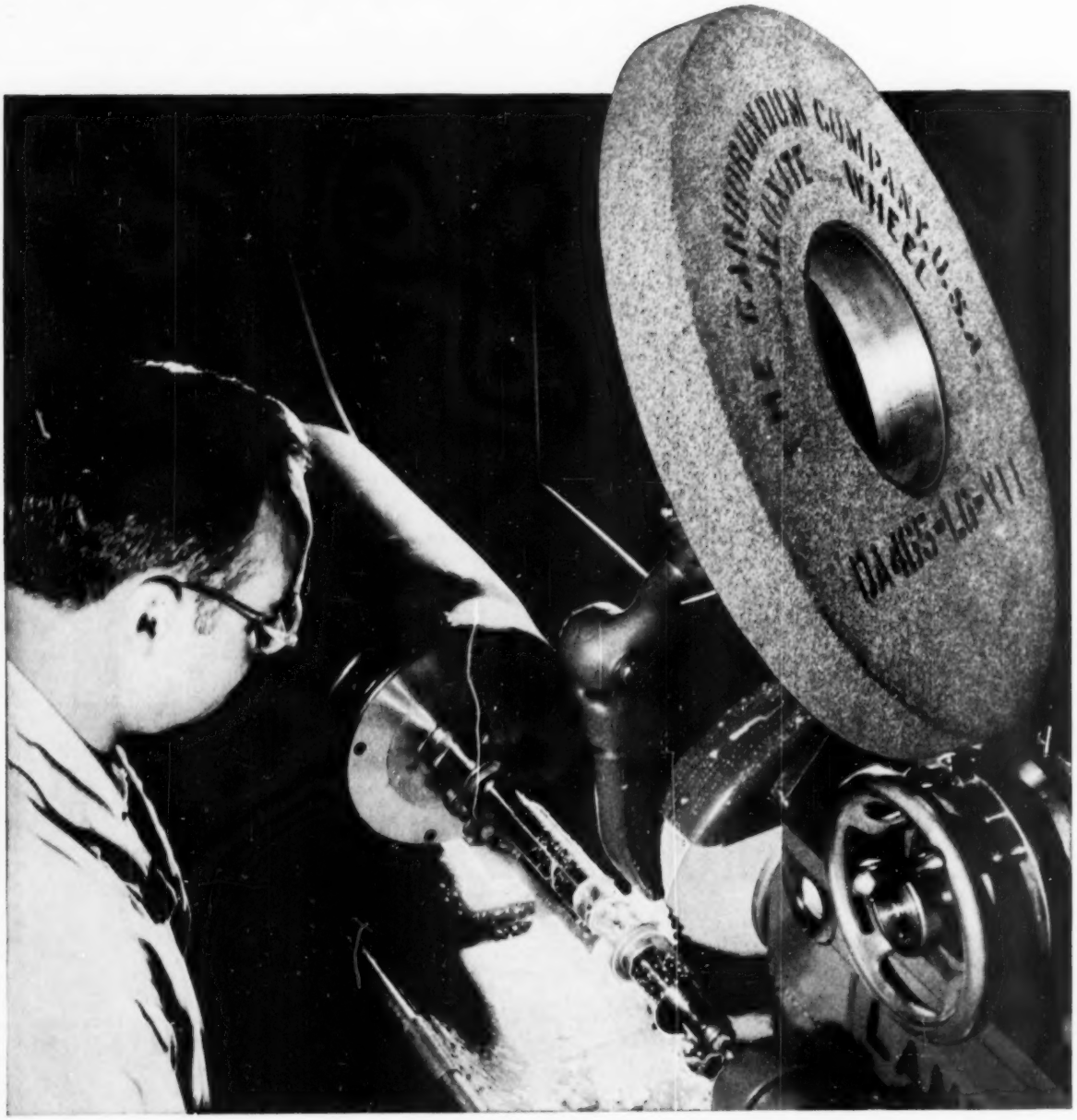

CARBO

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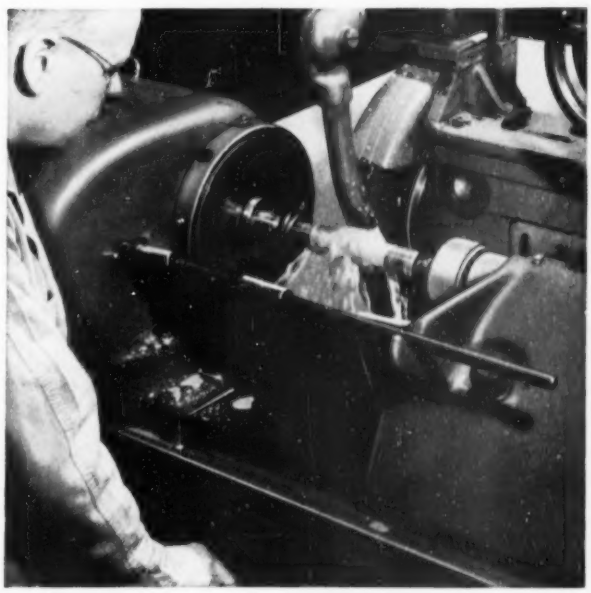
WHEELS on your job

...see *proof* that the right grinding wheel improves quality...boosts production...cuts costs

Make an *on-the-job* comparison of CARBORUNDUM's cylindrical grinding wheels with the wheels you're using now. Compare them for speed and accuracy of cut...for cool cutting action...long wheel life...economy. Find out what the *right* grinding wheel by CARBORUNDUM does for you—on your plain, universal, or special-purpose cylindrical grinder.



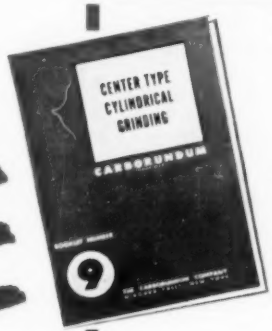
HOW TO CHOOSE THE RIGHT WHEEL

Your CARBORUNDUM Salesman or Distributor is the man to call. He'll visit your plant, analyze each part of your cylindrical grinding operation—your machines... the material you're grinding... your tolerance and finish requirements... the production rate you're after. Then he'll recommend the *right* combination of abrasive grain, grade, structure and bond—all engineered by CARBORUNDUM into a precision grinding wheel designed to give you the exact results you're looking for... the wheel which will give you highest output at lowest cost.

MAKE THE TEST TODAY—DECIDE FOR YOURSELF!

Call your CARBORUNDUM Distributor or Salesman. He's listed in the yellow pages under "Abrasives" or "Grinding Wheels." He's your best bet for experienced counsel ...and for prompt delivery from complete stocks...for every grinding job you do.

Get this helpful booklet FREE



THE CARBORUNDUM COMPANY, Dept. AM 81-321
Niagara Falls, New York

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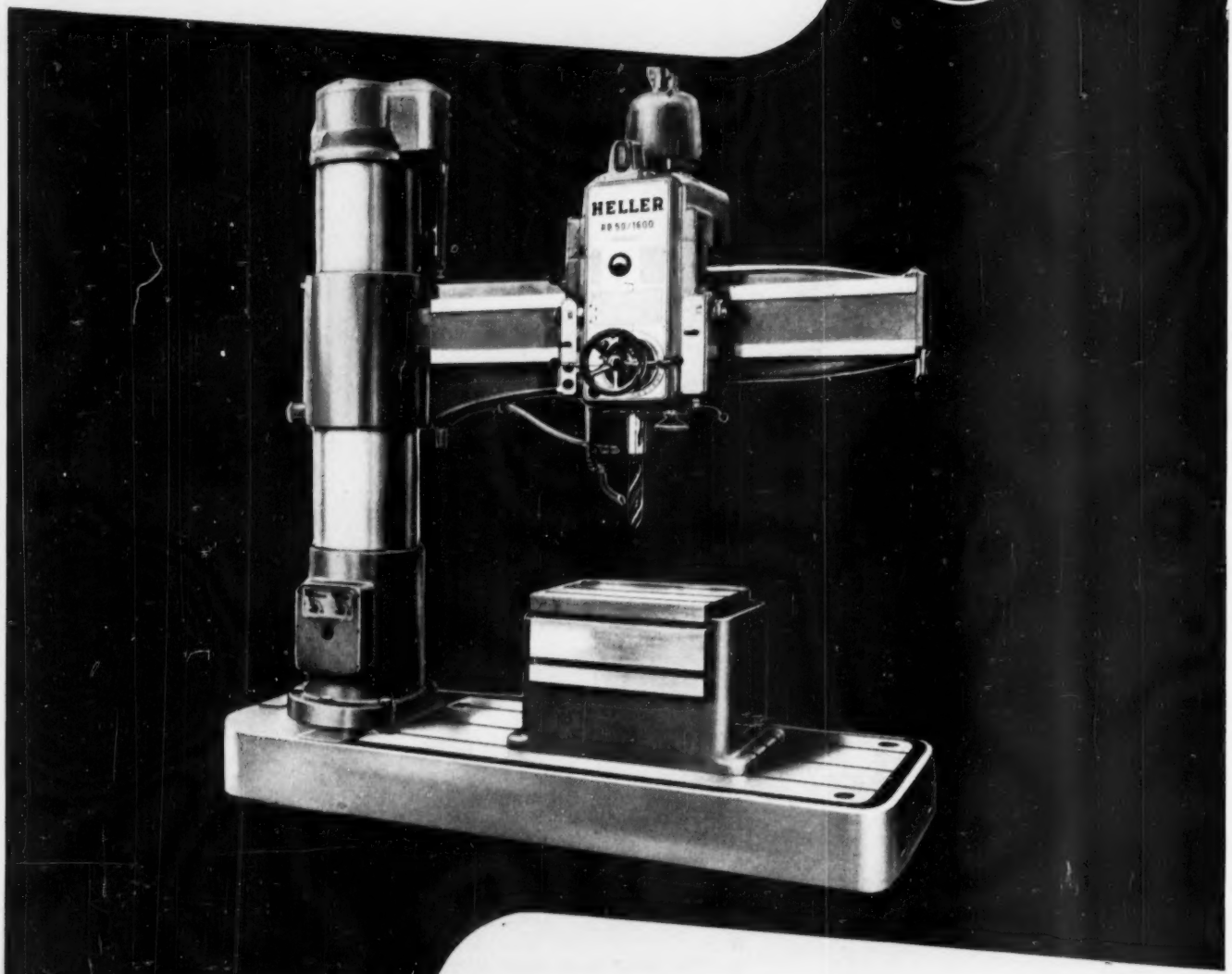

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114 Liberty St., New York 6, N. Y.

KNEE & PLANER TYPE MILLING MACHINES
COLD SAWING MACHINES • SAW SHARPENING MACHINES • SAW BLADES • TRANSFER MACHINES • SPECIAL MACHINES

Heller Radial Drilling machines are offered in 2½ foot, 4 foot and 5 foot arm types. Column is 16" in diameter and drive is by direct motor through multi-disc friction clutch. Gear change is simplified through preselector unit with automatic depth drilling and tapping switch. Arm raising and lowering and saddle adjustment is hydraulically locked as desired. Construction is complete with anti-friction bearings with special oil pump for saddle lubrication. In addition to Radial drills, we offer also Column Drilling Machines and Gang type drilling machines.

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This 42-72-84 Blanchard Surface Grinder is used for machining many sizes of torch cut steel plates. As the first operation after cutting, Blanchard grinding removes the proper depth of stock as required, frequently up to ⅛" per side, producing surfaces accurately flat and parallel for laying out or further machining. Work up to 7 feet across corners is regularly ground on this machine. In spite of its size, this grinder is as easily controlled as the smaller Blanchard grinders.

Typical of work produced is the 48" x 48" x 10" machine steel, die mounting plate, at left. 58 cu. in. of stock (.025" per side) is ground off in one hour and 35 minutes, floor to floor, with flatness held to .001". Note the magnetic hoist —a good tip for loading and unloading the Blanchard quickly.

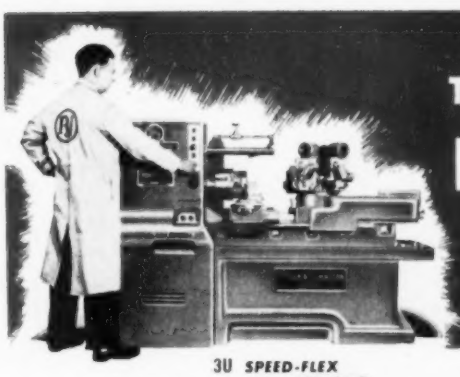
Regardless of your requirements for stock removal, tolerances or surface finish, Blanchard has the grinder and grinding wheel to do each job best.

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

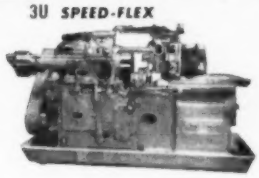
THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



THE COMPLETE LINE OF POTTER & JOHNSTON *Automatic Turret Lathes*

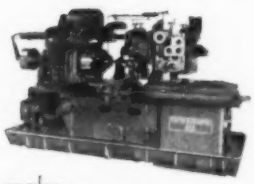
3U SPEED-FLEX



3U *SPEED-FLEX*

The Potter and Johnston 3U Speed-Flex is fast and fully automatic — the right machine to produce small, precision parts. Twenty-four spindle speeds from 73 to 1445 rpm with four automatic speed changes. For unusual versatility, front and rear cross slides can be operated simultaneously or independently with any of the six turret faces.

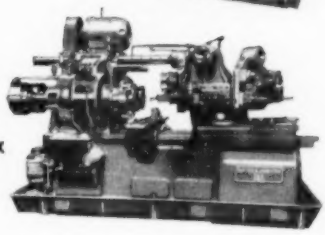
4D AUTOMATIC



4D AUTOMATIC

Made in two sizes (standard and elevated) with spindle speeds up to 696 rpm — suitable for machining castings and forgings up to approximately 10 inches in diameter.

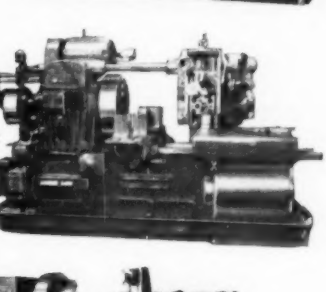
5D POWER-FLEX



5D POWER-FLEX

Built in three sizes (standard, elevated and elevated with long travel) with spindle speeds to 610 rpm. Will handle work up to about 14 inches in diameter.

5D-2 POWER-FLEX



5D-2 POWER-FLEX

Two-spindle machines (built in two sizes) are capable of high production machining. Work diameters up to 7 inches and 13 inches respectively are accommodated.

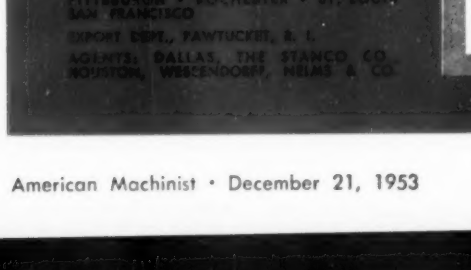
6D AUTOMATIC

6D AUTOMATIC

Available in three sizes and combinations of swings, travels and bed lengths. Will machine castings and forgings up to 18 in. in diameter and 20 in. long.

10-U AUTOMATIC

Designed for the rapid production of big work, the 10-U provides a 49 inch diameter swing over base ways, a 36 inch diameter swing over cross slides for chucking and a 27 inch diameter swing over cross slides for machining.



P & J Automatic Turret Lathes are accurate and rugged for lasting precision.

Literature, including complete specifications, for all P & J Automatics is available on request. Please specify model number.

POTTER & JOHNSTON CO.
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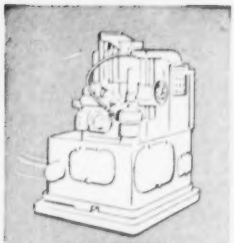
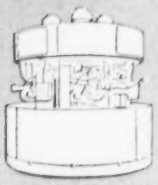
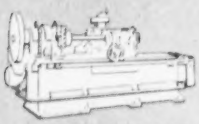
PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY



12-S HOBBER

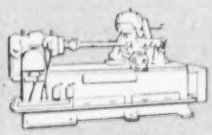


7-A ROTARY HOBBERS

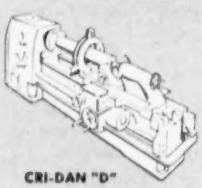


SH SPLINE HOBBER

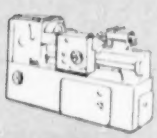
MODEL 40 THREAD MILLER



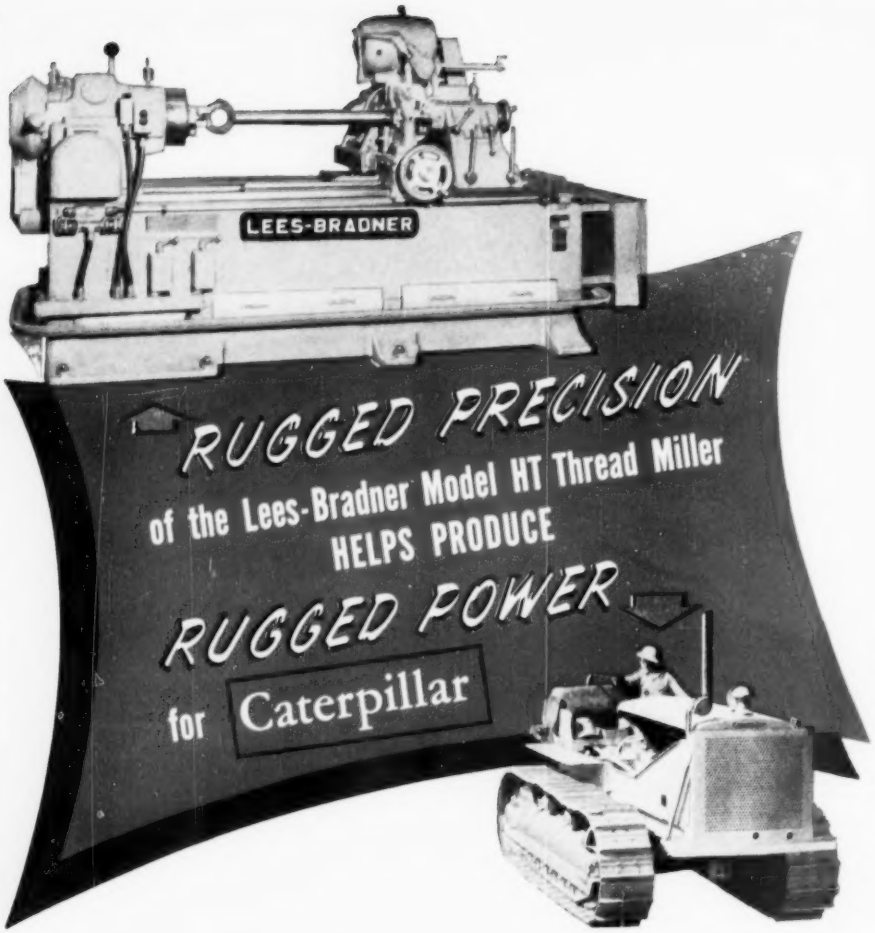
HT THREAD MILLER



CRI-DAN "D"



CRI-DAN "B"



It's not surprising that Caterpillar should select the Lees-Bradner HT Thread Miller to help produce the famous line of Caterpillar earthmoving equipment. They have a lot in common.

Both are extra rugged and unusually versatile. Both are built for long, efficient service and both are leaders in their respective fields.

No matter what the threading job, chances are the Lees-Bradner HT Thread Miller can meet your requirements—for accuracy, speed and the wide range of work it can accommodate.

Call your Lees-Bradner representative for the whole story on the HT Thread Miller—or write us direct.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

Hayes Scientific Appliances, Urbana, Illinois, often checks work done on their Cincinnati Tray-Top Toolroom Lathe with Zeiss Micrometers, and gets results consistent with inspections with gage blocks on a comparator! This, we think, is dramatic proof that you can do fancy lathe work on Cincinnati Tray-Tops at un-fancy prices. Ask your nearby dealer to show how and why balanced design Cincinnati Tray-Tops deliver important bonuses in precision as well as production.

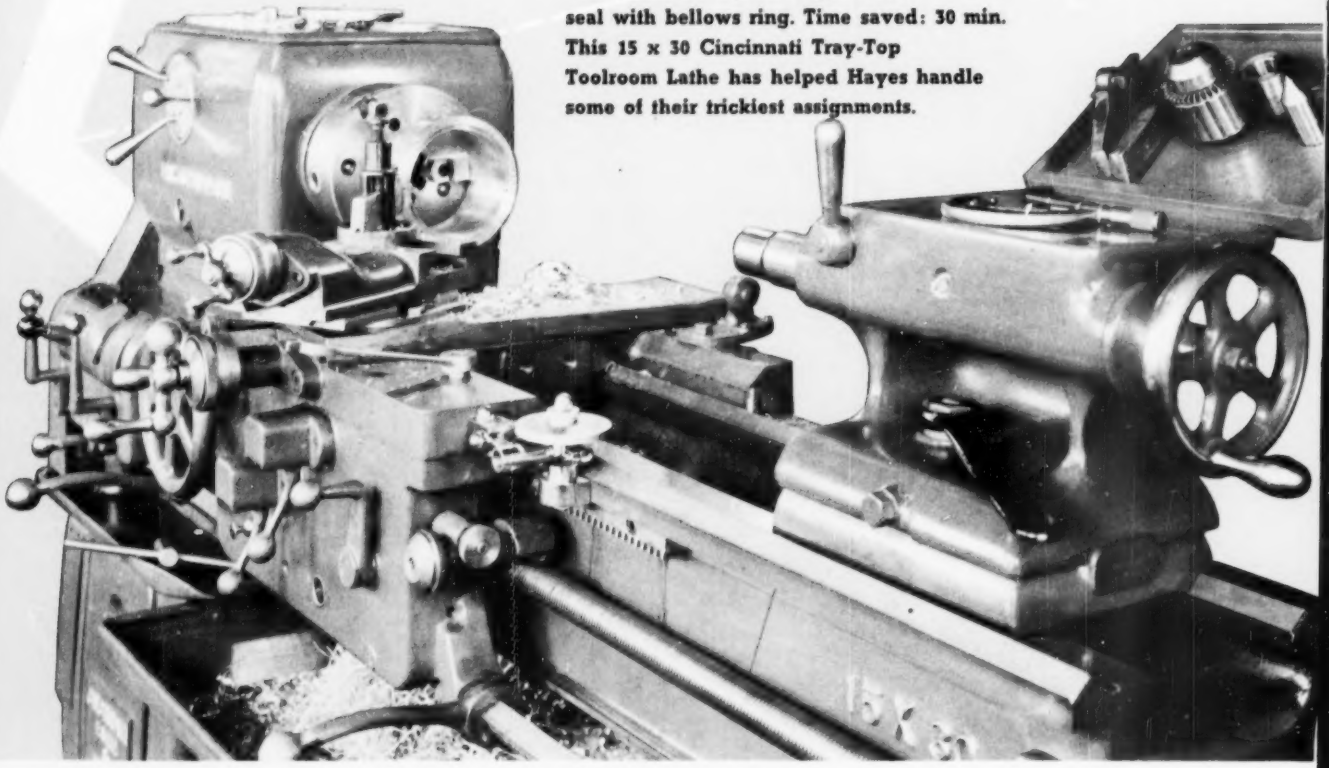
best buys in their class!

CINTI LATHE

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.

PRECISION PLUS | AND LOW COST

The part: bronze cap for vapor condenser, made by Hayes Scientific Appliances. Tolerances: fit to cylinder within .0003. Faces must be flat and square to seal with bellows ring. Time saved: 30 min. This 15 x 30 Cincinnati Tray-Top Toolroom Lathe has helped Hayes handle some of their trickiest assignments.



CINTILATHES: The complete, balanced line;
Tray-Top for light duty (engine, toolroom and gap bed models);
10", 12½", 15", 18" sizes; 18" to 114" center distances.
Model LT for medium duty (engine and gap bed models).
16", 18", 20", 24" sizes; 30" to 264" center distances.
Write for catalogs and name of your nearest dealer.

best buys in their class!

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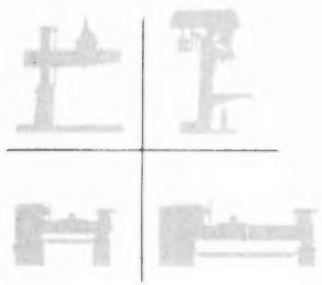
CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.



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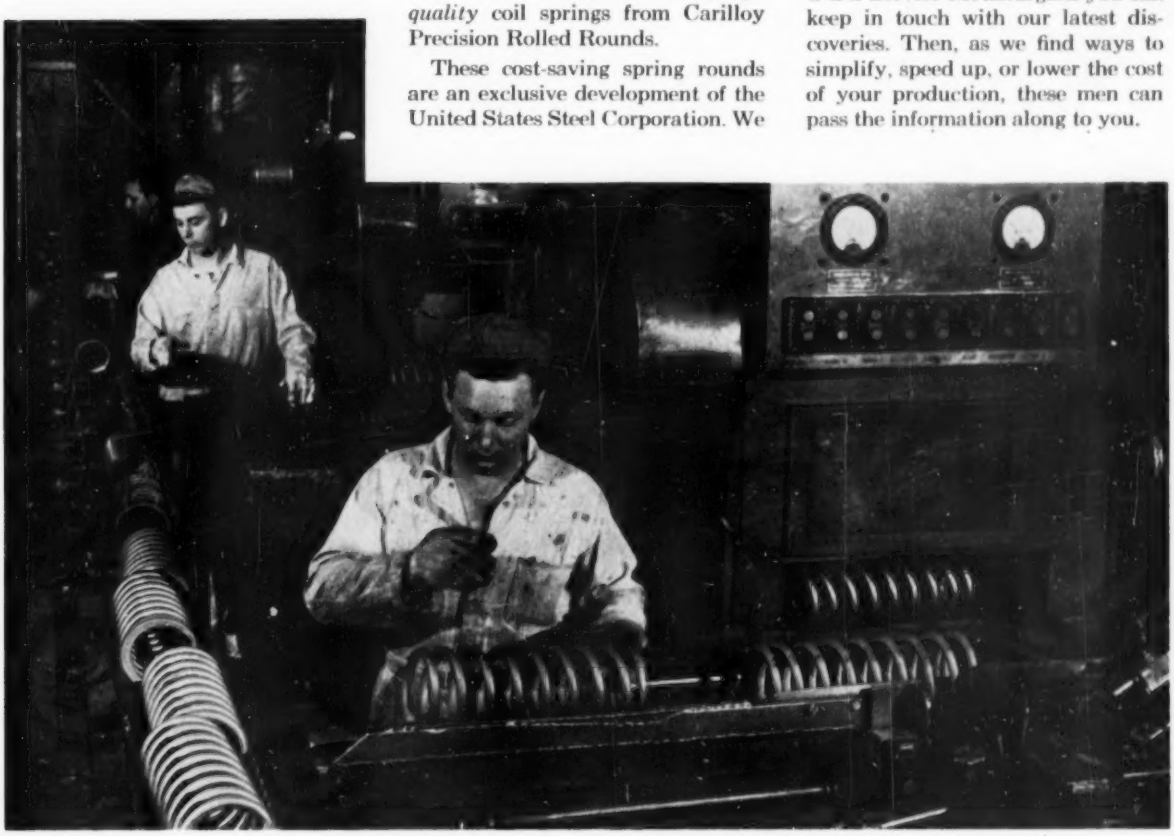
Why are half of all the coil springs in American cars made of U·S·S Carilloy steel?

THE REASON IS SIMPLE. While ordinary hot rolled bars require extensive grinding to remove harmful seams, pits, and decarburization, Carilloy Precision Rolled Coil Spring Rounds require very little grinding; in fact, they are often used *as furnished* with no grinding at all. That's because they are rolled on a special mill to half of standard tolerances and with very little decarburization. As a result, it costs less to make *high quality* coil springs from Carilloy Precision Rolled Rounds.

These cost-saving spring rounds are an exclusive development of the United States Steel Corporation. We are continually searching out ways to make steel better, discovering better ways to fabricate steel, and finding new and better uses for steel.

By contacting our nearest sales office and consulting frequently with U·S·S Service Metallurgists you can keep in touch with our latest discoveries. Then, as we find ways to simplify, speed up, or lower the cost of your production, these men can pass the information along to you.



UNITED STATES STEEL CORPORATION, PITTSBURGH · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
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"Fire-Engine Speed" on Deliveries

Always Ready to "Hunt Down" New Ideas

Business Services that save your time and money

"Bachelor of Saws" is the *nth degree* in sales engineering for distributors of Simonds Saws, Machine Knives and Files. And it's a degree *personally earned* by Simonds Distributors, and many of their men, at the "Little Red Schoolhouse" in Simonds' controlled-conditions factory.

Here to Fitchburg come scores of Simonds Distributors' Salesmen from all over the country . . . for an intensive course in the design, manufacture, and practical application of Simonds Cutting Tools to all types and makes of machines for cutting wood and metal. And the Schoolhouse diploma calls for a definite investment in grey matter and shoe leather by every man! So you can be sure that these men are highly competent to advise you on any problem involving Simonds Cutting Tools . . . *the tools that are 100% quality-controlled.*

This is one of many special services offered by your Simonds Distributor . . . including quick deliveries, ample stocks, simplified paperwork (one order, one bill, one payment for many items), and even help in hunting down new developments and products. Call him. He'll come at the drop of a hat . . . *any hat you want him to wear.*

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FITCHBURG, MASS.

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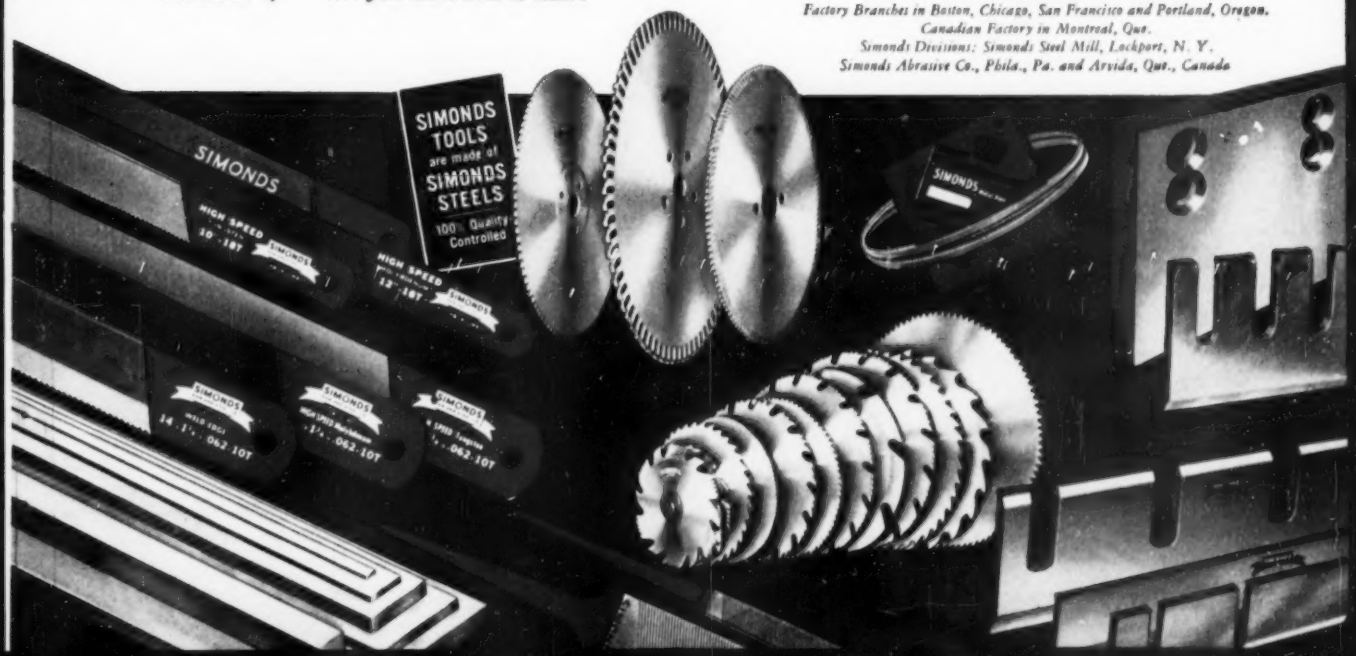
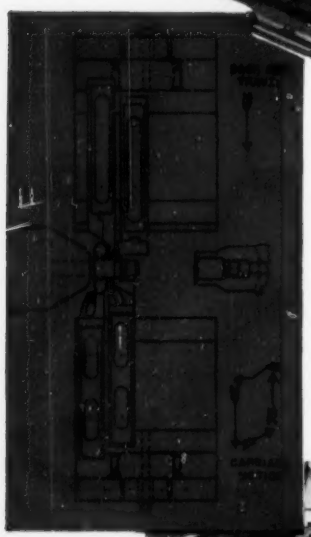
Canadian Factory in Montreal, Que.
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada



AUTOMATICITY BACKS UP HIGH VELOCITY TURNING ON FAY AUTOMATICS

SIDE GEARS
18 Seconds Floor to Floor — 635 SFM

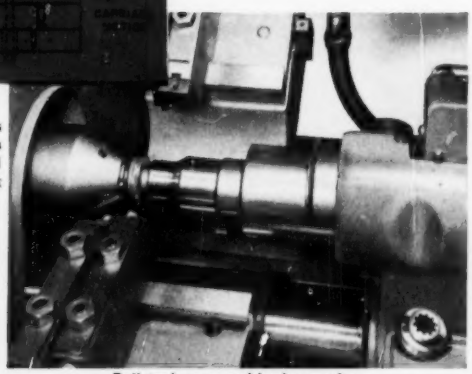
Two 8" Fays, with Automatic Sequential Control, machine all exterior surfaces of the blanks in two operations; one machine for each. The major diameter is 2-15/16" and floor to floor time is approximately 18 seconds in each operation.



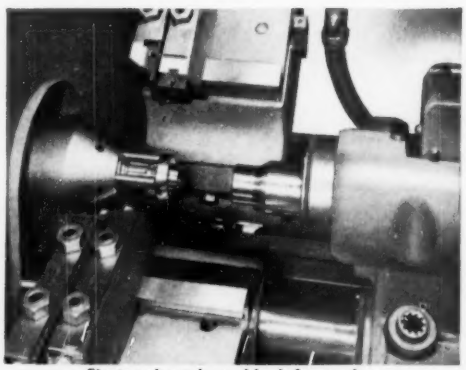
Automatic Cycle—The machines are equipped with automatically operated splash guards and automatically air-operated tailstock rams for pressing the blank onto a splined arbor equipped with automatically operated ejector pins.

The operator places the blank on the end of the arbor, and pushes the cycle start button. *Automatically, the guard closes, the tailstock ram presses the piece onto the arbor and then retracts. The carriage turns, the back arm faces, and at the end of the cuts, ejector pins push the piece onto the loading section of the arbor* from which it is removed manually.

FIRST OPERATION: Note intricate movements of the carriage, which turns the hub, back angle and major diameter. The back arm faces and forms.



Tailstock presses blank on arbor



Ejector pins release blank from arbor

Production management regularly relies upon the engineering services of Jones & Lamson for the latest information on methods, costs, tooling and performance. Why not consult us about YOUR *turning, threading and inspection problems.*

JONES & LAMSON

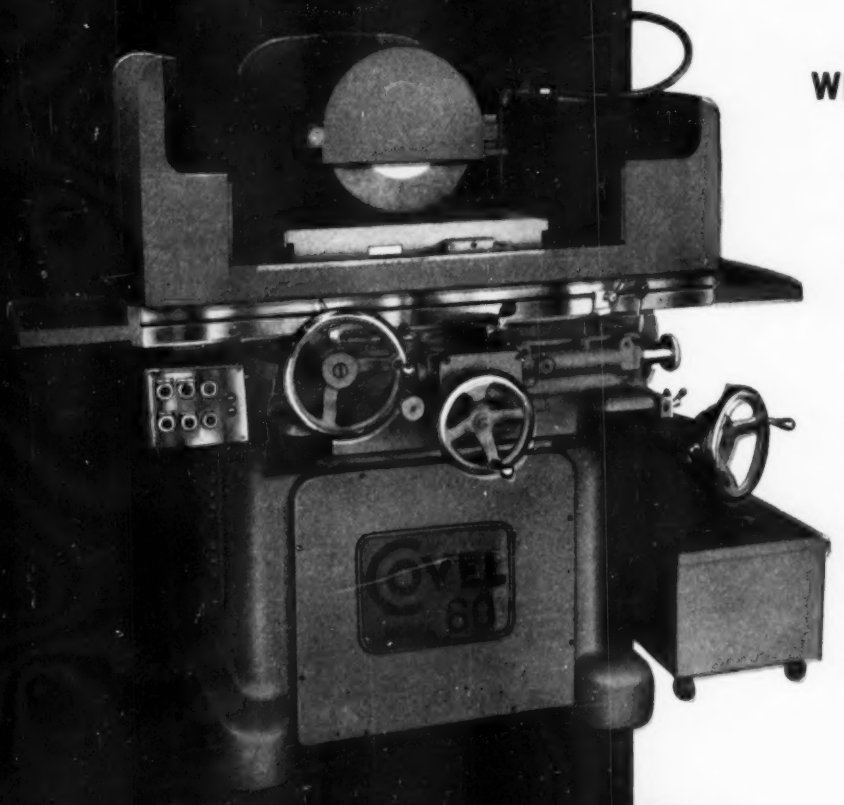
Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

FAY LATHE DIVISION

COVEL No. 60 SURFACE GRINDER . . . ENTIRELY NEW

WITH 15" CROSS FEED



Covel presents the No. 60 — latest in its 80-year line of precision machines . . . This ultra-modern surface grinder features a 14" x 24" work surface . . . 15" width of cross feed . . . 27" table travel . . . vertical work capacity of more than 18" . . . automatic, closed circuit hydraulic system . . . powered elevation and a long list of advantages best described in a new bulletin . . . yours for the asking.

Here's a Typical Use:

This new "60" is set up for wet grinding the surface of a trim die for die castings — but one of the wide range of tool room and production jobs for which this latest Covel grinder is suited.

WRITE FOR *New Bulletin* No. A-263

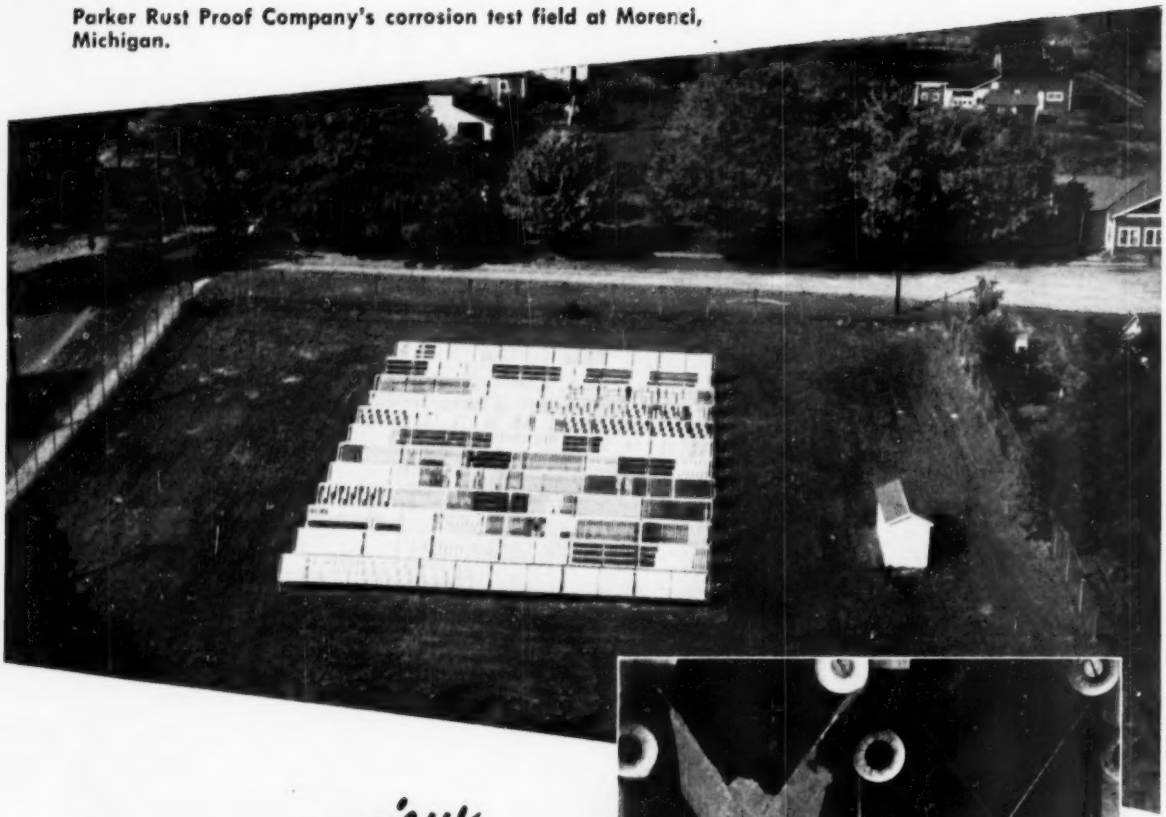
80 YEARS of continuous manufacturing experience makes your COVEL choice a sound one

COVEL PRECISION GRINDERS

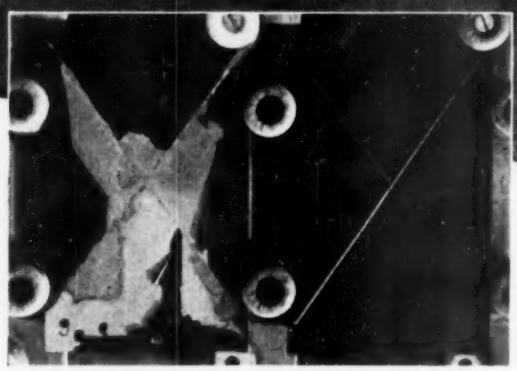
BENTON HARBOR, MICHIGAN

DRILL GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS

Parker Rust Proof Company's corrosion test field at Morenci, Michigan.



Birds-eye view of a strange crop



What weather does to finishes! Panel left, paint over untreated aluminum. Panel right, paint over Bonderite-treated aluminum. 11 months outdoor exposure.

A crop of 6,400 metal panels is tended in Parker Rust Proof's outdoor test field. The harvest is facts on the durability of various finishes over various metals.

Conditions here are the same as are met by painted products in daily outdoor use. The sun and the wind, the rain, sleet and snow pound at these panels continually. Parker technicians watch each set of panels individually, observe their condition, chart results at regular intervals.

This large-scale outdoor testing program, continuous since 1935, has helped build Parker's great fund of valuable information on how to control corrosion. The facts we learn from the corrosion test field are passed on to guide our customers to more effective, more economical surface treatments for metals.

*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

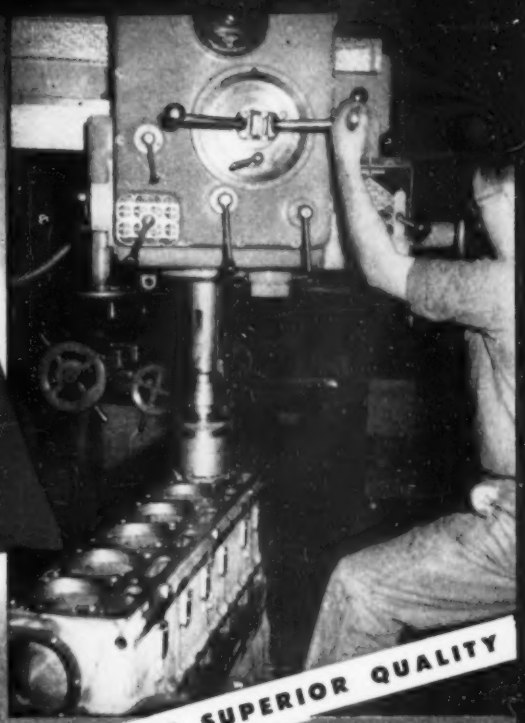
Since 1915—leader in the field

PARKER RUST PROOF COMPANY

2196 E. Milwaukee Ave., Detroit 11, Michigan

BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces

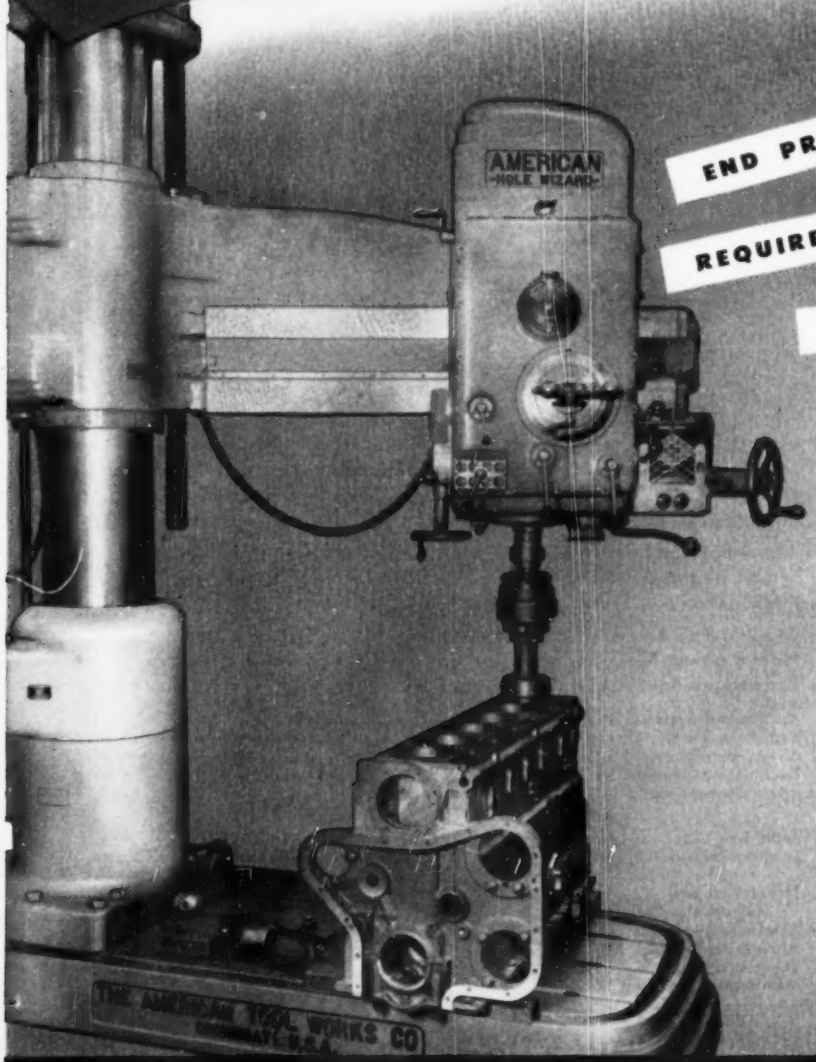
The 2 are inseparable—



END PRODUCTS OF SUPERIOR QUALITY

REQUIRE SUPER QUALITY EQUIPMENT

TO PRODUCE THEM . . .



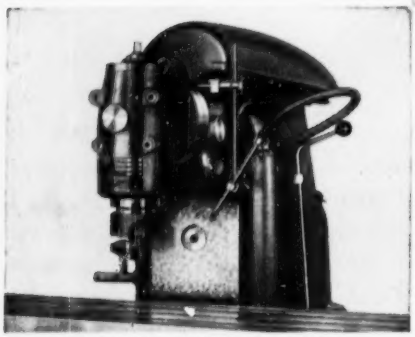
For six years this "AMERICAN" Hole Wizard Radial has been counterboring "Cummins" Diesel Engine Blocks and holding the required depth tolerance of .001" in the 6.125" counterbores. Furthermore, the operator testifies to the fact that the machine is convenient and easy to operate and maintenance has been negligible.

The quality of "Cummins" products is universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to it.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Swedish Craftsmanship!



Sajo Vertical Milling Attachment

The Sajo "Plain" Milling Machine

the SAJO "UNIVERSAL" MILLING MACHINE

exemplifies the expert workmanship that is traditional in Swedish machine tools. Like all SAJO Millers, this new Universal Milling Machine was designed and built to the highest standards of quality and practical utility.

Avoidance of exterior "luxury" features, slight in value but substantial in cost, and concentration on the vital factors of construction, enable the SAJO to deliver top performance at moderate cost.

SAJO Millers are available in Plain and Universal types, with longitudinal power table feed only, or with power feed in all directions. Screws and dials are in the U. S. inch system.

★ **Standard Equipment includes:**
3 HP motor and starter equipment, motor driven coolant system, adjustable table feed nut to allow climb-milling, 1" arbor, arbor support brace.

★ **Extra Equipment:**
Universal Dividing Head, Vertical Milling Attachment, Slotting Attachment, Swivel Base Vise, Rotary Table.

CONDENSED SPECIFICATIONS

Table Size	41½" x 9¼"
Longitudinal travel: Plain Miller	24½"
Universal Miller	27½"
Transverse travel	8¼"
Vertical travel	19"
12 spindle speeds	36-1540 RPM
Table feeds	12
Taper in spindle	No. 40 NMT
Main motor	3 HP

Precision anti-friction bearings on spindle and gear shafts
One-piece column and base
Net weight – 2200 lbs.

Write for Catalog

NO PRIORITY—— PROMPT DELIVERY——ATTRACTIVE PRICE

AUSTIN INDUSTRIAL CORP. 76-F MAMARONECK AVE. WHITE PLAINS, N. Y.
DEALERS IN PRINCIPAL CITIES

FOR THOSE TOUGH *Special* JOBS
...DEPEND ON

National Tool Co.

● **Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.**

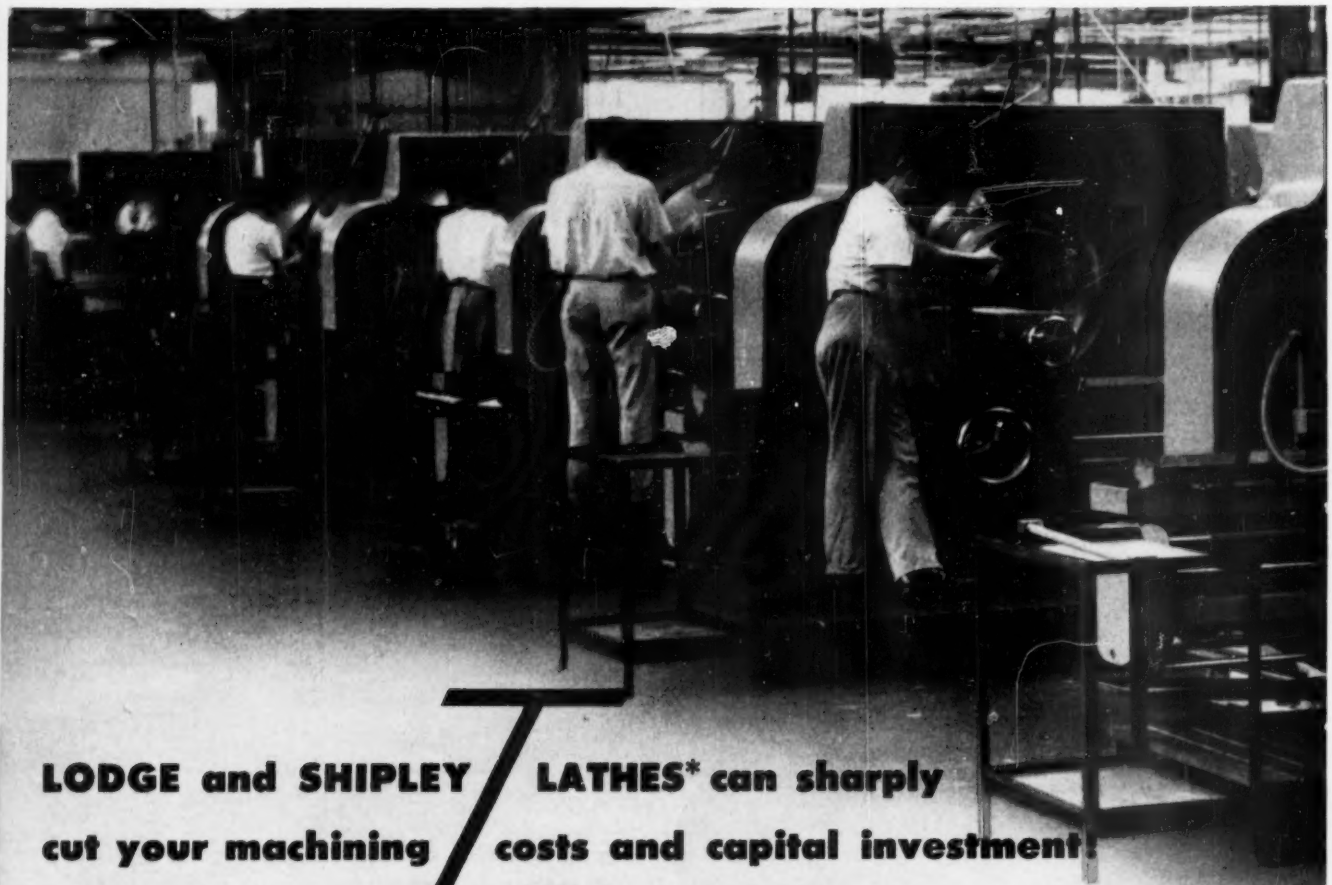
Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

responsive to the lightest touch

equal to the toughest job . . .



LODGE and SHIPLEY T LATHES* can sharply cut your machining costs and capital investment.

In jet engine, and many other fields as well, the Lodge & Shipley T Lathe offers outstanding advantages for profitable production. These lathes are faster and more sensitive for facing, turning and boring any thin-wall section work of large diameter and short length.

Many manufacturers have found the simplicity of the T Lathe and the accessibility of its controls make it the logical choice for such work.

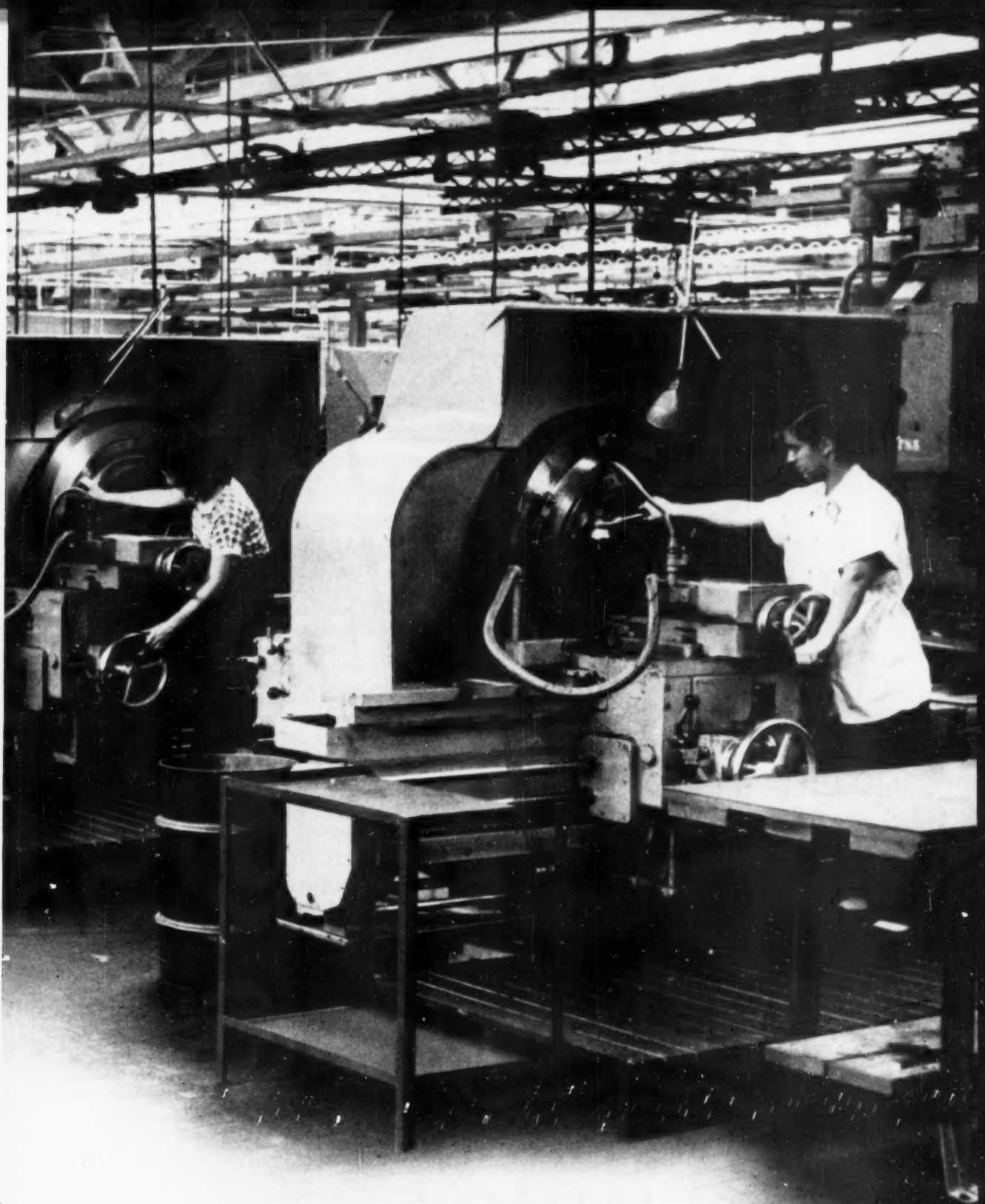
The T Lathe is twice as compact, costs far less than oversize lathes or vertical boring mills formerly used for this type work. Investigate how the T Lathe can cut your machining costs and capital investment.

Write for detailed information and Bulletin No. 215 and 215 Supplement. The Lodge & Shipley Company, 3055 Colerain Avenue, Cincinnati 25, Ohio

Lodge & Shipley

....your LODGE-*ical choice!*

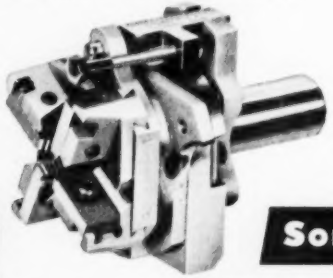
* T.M. The Lodge & Shipley Co.



Battery of 8 Lodge & Shipley T Lathes at one of the nation's largest jet engine plants.

JONES & LAMSON GUARANTEES CLASS III THREADS with REPETITIVE ACCURACY!

J & L Automatic Opening Die Heads are sold with this guarantee: that your threads will be held consistently within the exacting Class III tolerances for form, lead and pitch diameter, throughout the long life of the J & L chasers.



FOR BROWN & SHARPE AUTOMATICS and SMALL TURRET LATHES
Capacities from #0 to 1¼"

RADIAL CHASER TYPE
Capacities from #8 to 4¼"

TANGENT CHASER TYPES
Stationary and Revolving. Capacities from #4 to 2"

Some of the reasons why:

COMPACT, RUGGED DESIGN GIVES MAXIMUM SUPPORT TO THE CHASERS. J & L Dies are made of solid steel, no built-up sections, hardened and precision ground throughout. Chasers are supported at the point of, and in the direction of, maximum strain.

THREAD FORM, HELIX, PRECISION POINT HEIGHT, ARE ALL GROUND INTO CHASERS AFTER HARDENING. This gives you a freer cutting tool, operating with minimum wear and repetitive Class III accuracy. The high precision of the J & L chasers is maintained in the Die by exclusive chaser holding features.

EASY, CONTROLLED RESHARPENING. J & L chasers are resharpened independently of the holders or dies. Instructions are simple, easy to follow. Eliminates guesswork. Exclusive holding features assure accurate resetting.

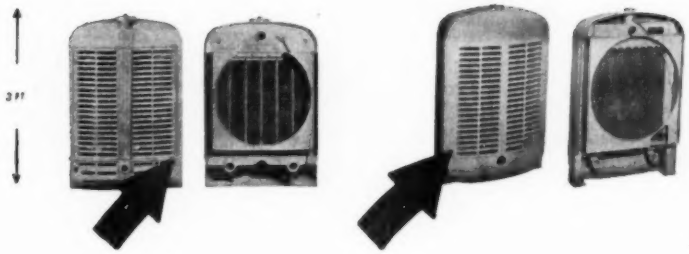
Only J & L Die Heads and Chasers give you ALL these features. Write to Dept. 710 for illustrated catalogs and complete information.

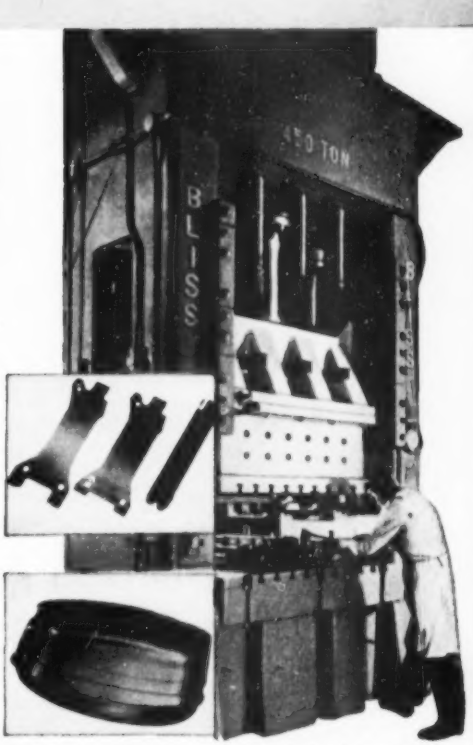
JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L **DIE HEAD DIVISION**

The trend is to more stampings WITH **Bliss** PRESSES





Shown here are the second and third forming operations on radiator side members (inset, top). A third die handles initial piercing. A Bliss hydraulic cushion ejects the stamping... is also used as blankholder to draw the shell. Shells are center-split to form top and bottom of radiator housings (inset, bottom).

Casting-to-Stamping saves as much as 30% for Young Radiator Company

When Young Radiator Company, Racine, Wis., decided to redesign their line of automotive and industrial radiators, their thoughts turned to lighter, stronger, more clearly designed components. To gain these new design objectives, they converted from castings to stamped steel parts. And as they had done for 20 years, they asked Bliss to specify the right press for the job.

Bliss engineers studied the problem, recommended a 450-ton single-action Hydro-Dynamic press. Result: savings up to 30 percent; weight of the radiators halved; strength increased.

Says President F. M. Young, "We've long been advocates of Bliss presses and service." Proof of the statement is the fact that 70 percent of Young's pressroom is Bliss. Why not bring *your* metal-forming problem to Bliss? You'll find—as Young Radiator did—that Bliss has a press for almost every metal-forming operation.

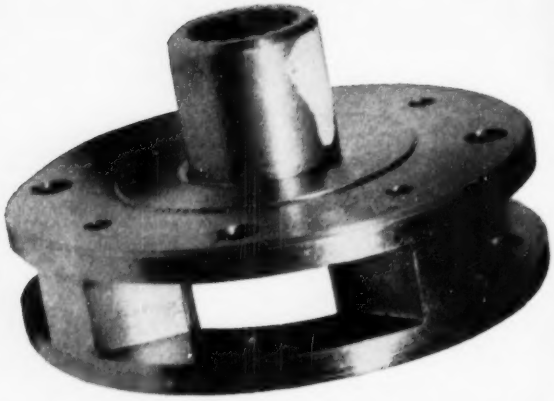
E. W. BLISS COMPANY, CANTON, OHIO
E. W. Bliss (England) Ltd., Derby, England
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

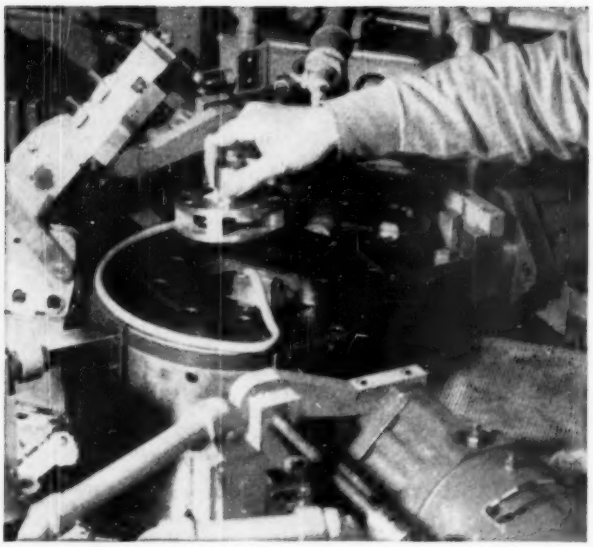
Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo, and Toronto, Canada. **West Coast Representatives:** Moore Machinery Company, Los Angeles and San Francisco; Star Machinery Company, Seattle. **Other dealers** in United States cities and throughout the world.

Bliss

on your press is more than a name... it's a guarantee!



This is an automotive turbine part. In producing the piece it was found that after milling, one-eighth inch of stock needed to be removed from each end of the four pinion slots in the part (the stock to be removed is shown by the colored area).



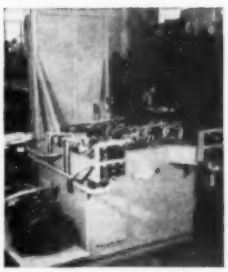
This close-up shows how American engineers attacked the broaching problem. With high production as their goal they devised a machine that would allow all 4 pinion slots to be broached by four radially located reciprocating rams operating in sequence on one fixture.

Special *American* machine helps solve broaching production problem

In nearly every manufacturing operation, sooner or later a metal removing problem occurs that can be solved economically, only by broaching. Usually operations such as these are on high production runs that demand special machines and special techniques. Conventional methods could have been used to remove the small amount of metal required on these automotive turbine parts. But — conventional methods would have greatly reduced production and increased overall time and costs.

American designed a special 4-ton machine to broach the four radial holes of the turbine parts with push broaches. The part is loaded, automatically clamped into place, and then each of the four radially located reciprocating rams working in sequence, push the broaches through the pinion slots and finish the pocket edges. At 100% efficiency the machine can turn out 300 pieces per hour.

Many times production problems such as this one do not require a special machine —but can be handled quite efficiently on a standard American machine. Adapting your problems to American machines is simple work for our engineers. Send us a part-print or sample and your hourly requirements. We'll give you our recommendations with absolutely no obligation on your part. Address Dept. P.



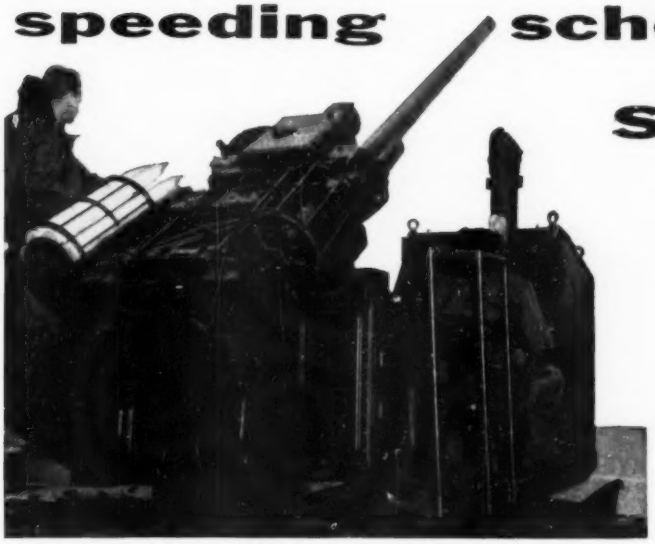
This is the special machine built by American to solve this broaching problem. We can help you, too. Write us today for information on your particular problem or send for Catalog 300. It illustrates and describes standard American machines.

AMERICAN *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

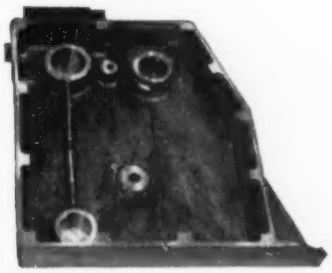
SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

BICKFORD SAVES 17% WHILE speeding schedules on Skysweepers



Photos courtesy of American Machine & Foundry Company.

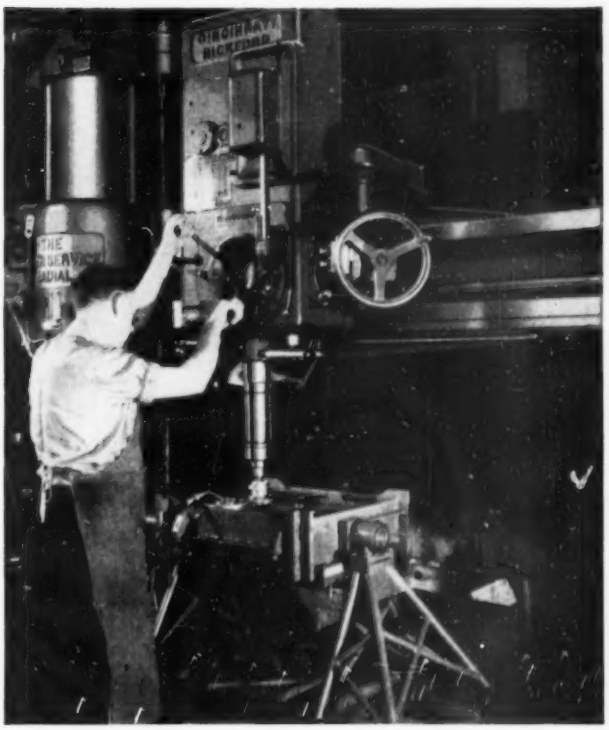


Drilling operations are performed on right and left-hand housings (steel weldments) of the U. S. Army's anti-aircraft "Skysweeper". Time was cut from 3 hours to 2½ hours, and accuracy of bore held within .0006".

The American Machine & Foundry Company states—"We like this machine not only for its performance and ease of handling but because of its flexibility of control, power and ability to stand abuse as well."

This Cincinnati Bickford Super Service Radial effected a 17% saving and speeded schedules. The machine is used to drill and tap, rough bore, finish bore, and ream.

Write for Booklet R-29



CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

HIGH SPEED
HYDRAULIC

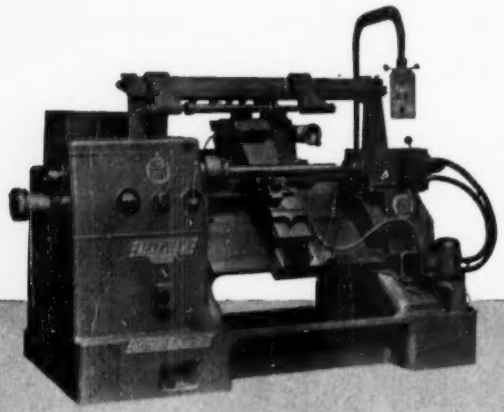
Copying Lathes

for every purpose!

THE TURNING METHOD OF THE FUTURE TODAY!

The greatest advance in turning methods since the development of carbide tools! Whether your production is on a large scale or you need short, economical runs, there is an H.E.B. Copying Lathe to fit the special needs of your operation.

Why use a dozen tools when the H.E.B. *with just a few* does the job faster, better and at less cost! Incorporating the patented H.E.B. tracer device these versatile machines give you maximum output at high speed with remarkable accuracy and finish.

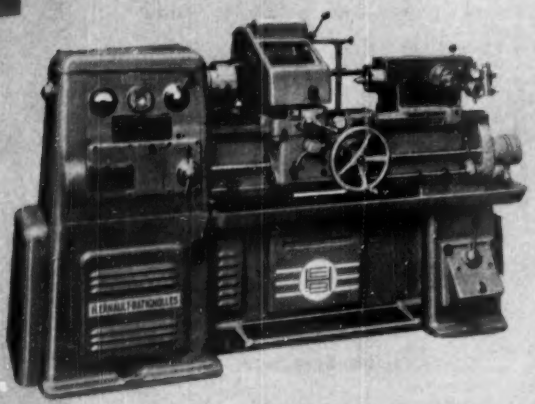


H.E.B. PILOTE COMPLETELY AUTOMATIC HYDRAULIC COPYING LATHE

The first *completely automatic* hydraulic copying lathe. The operator has only to load the machine and *press a button* to start the cycle. When the part is finished the tool returns to its starting position and the spindle stops automatically! Savings in setup time and tooling costs are enormous. Motors to 60 H.P.

COMPLETELY AUTOMATIC

SEMI-AUTOMATIC



H.E.B. HIGH SPEED HYDRAULIC COPYING LATHE

This absolutely rigid, chatter-free machine with built-in tracer device eliminates costly down time, takes no more than 10 to 20 minutes for setting up and the finished parts are copy turned up to 300% faster than on multi-tool lathes.

The OP Model, with its 20 H.P. motor, takes heavy cuts with carbide tools at spindle speeds 50 to 3600 RPM. GT Models with rotating pattern are designed to copy an infinite variety of non-circular work.

These machines are designed and built in France by H. Ernault Batignolles, machine tool manufacturers for almost a hundred years. If you want more information about tomorrow's turning methods, then write, wire or telephone now for a demonstration or catalog. See our insert in Sweet's Machine Tool Catalog.

"THE WAY TO TURN"

H·E·B

H. E. B. MACHINE TOOLS, INC.

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TELEPHONE: LEXINGTON 2-0266

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"STANDARD for tough jobs since 1881"

Red Shield says:

Call your Industrial Supply Distributor for Shield Brand Slitting Saws.
Specialized factory service available everywhere.

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FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

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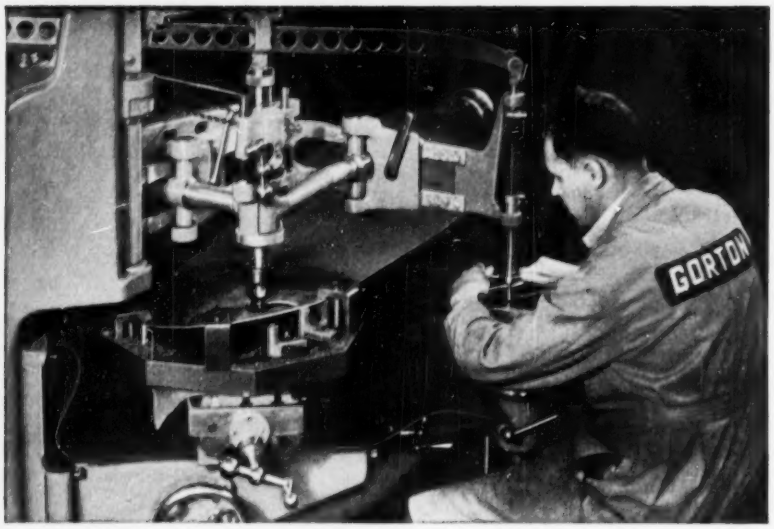


Tracer-Controlled Pantograph cuts and rounds thermal slot in 8-foot steel propeller blade in 40 minutes; previous time was 5 hours, 10 minutes — just one of hundreds of examples of time and cost saving with tracer-controlled Pantograph machines.

Pantography IS NEW —

By George Gorton III
Executive Vice President,
George Gorton Machine Co.

— in the sense that industry at large and Metal Working people in particular are just beginning to appreciate the many advantages Pantography offers to those faced with the Design-Production problems of today and tomorrow.

INDUSTRY'S foremost responsibility right now is to produce faster, to highest quality standards and at lower cost — whether on defense contracts or for our civilian needs.

Today, there are literally thousands of operations being performed throughout industry which can be speeded up, improved in quality and lowered in cost by the use of available models of special machine tools. The modern tracer-controlled Pantograph machine is such a tool. It is both a special purpose machine, ideal for short runs, and it is an accurate single purpose machine which turns out identical parts or pieces to meet tight production schedules.

The tracer-controlled Pantograph machine is used for inside and outside profiling, routing, die sinking, mold cutting, counterboring, contour milling, chamfering, grooving, graduating and engraving in ferrous and non-ferrous metals, as well as in plastics.

This machine performs on flat, uniformly curved, cylindrical, spherical or irregular shapes — it works in either 2 or 3 dimensions, in all directions on a horizontal plane, and vertically. It employs enlarged masters, templates or patterns which are quickly and easily made and operates normally at a reduction ratio thereby increasing accuracy — exclusively characteristic of the pantograph.

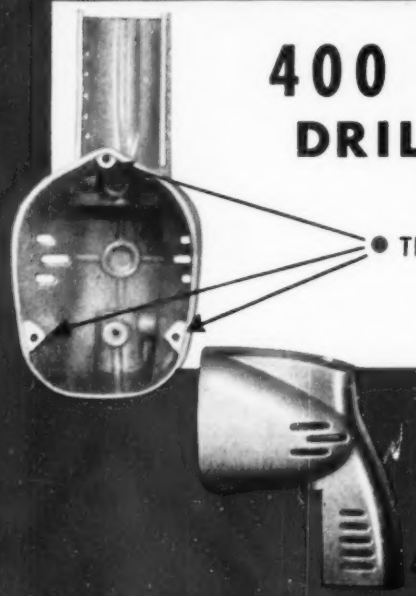
Single or repetitive accuracy — from one piece to thousands — manual or full automatic operation depending upon quantities — work sizes from the size of a dime to as large as 10 feet.

A new booklet, "Pantography," explains the process and shows what this type of machine can do for you. It is yours without obligation. Write for it today. If interested, also ask for our latest General Catalog 1655. Address the George Gorton Machine Co., 1512 Racine Street, Racine, Wisconsin, U. S. A.

AN A33A NATCO PROVIDES

High Production plus Flexibility

FOR THOSE SMALL PARTS



400 SMALL PARTS
DRILLED or TAPPED
PER HOUR

- THREE .1065 HOLES DRILLED OR TAPPED 6-32 TAP IN HAND DRILL HOUSING

JUST ONE OF MANY PARTS drilled and tapped on these NATCO High-Speed adjustable A33A machines

Another example of light sensitive machines

NATCO ENGINEERED
for Quality and Quantity Production

NATCO DRILLING, BORING, FACING AND TAPPING MACHINES

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices: CHICAGO, 2009 Engineering Bldg. • DETROIT, 409 New Center Bldg.
BUFFALO, 1807 Elmwood Ave. • NEW YORK, 35 Beechwood Ave., Mount Vernon

Call a Natco Field Engineer

HARDINGE PRECISION LATHES

ELMIRA, N.Y.

AT CANADA'S NEWEST AIRCRAFT ENGINE PLANT

Canada's newest aircraft plant, Canadian Pratt & Whitney Aircraft, selected only the finest machine tools for its up - to - the - minute shop.

The two Hardinge DV 59 Lathes shown are being used on work for the Pratt & Whitney R1340 Wasp radial piston engine.

HARDINGE High Speed Precision Lathes meet all important requirements of correct size, high speed, and precision operation so essential for work such as that of the Pratt & Whitney Aircraft plant.

The Hardinge DV 59 High Speed Precision Lathe is the logical choice for tool room work, production departments and laboratories.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

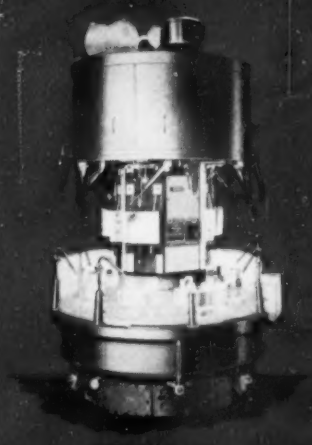
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

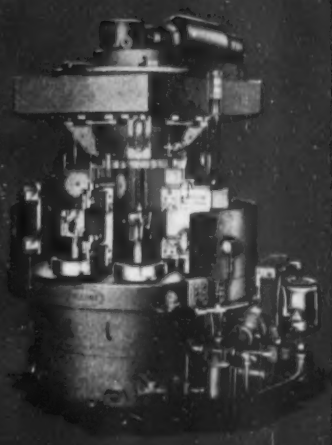
MORE PRODUCTION THROUGH

Modernization

with

BULLARD

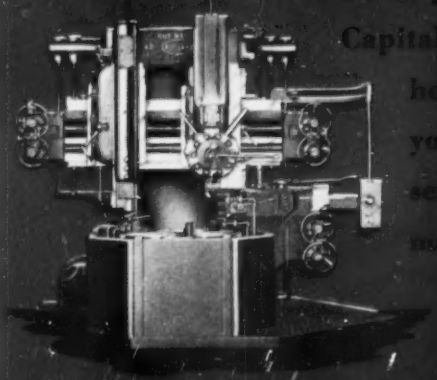


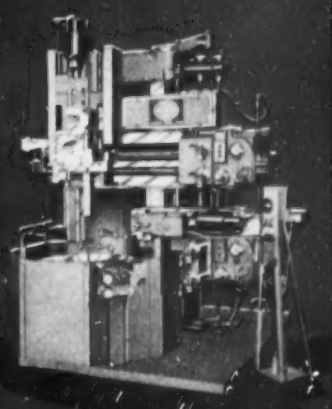


MACHINE TOOLS

Many complicated and diversified metal working operations are being efficiently performed on Bullard Machine Tools. They speed up production . . . reduce scrap to a minimum . . . produce better pieces at lower cost.

Capitalize on Bullard "know how" as others have—call in your nearest Bullard representative or write for information on the Bullard Line.





The

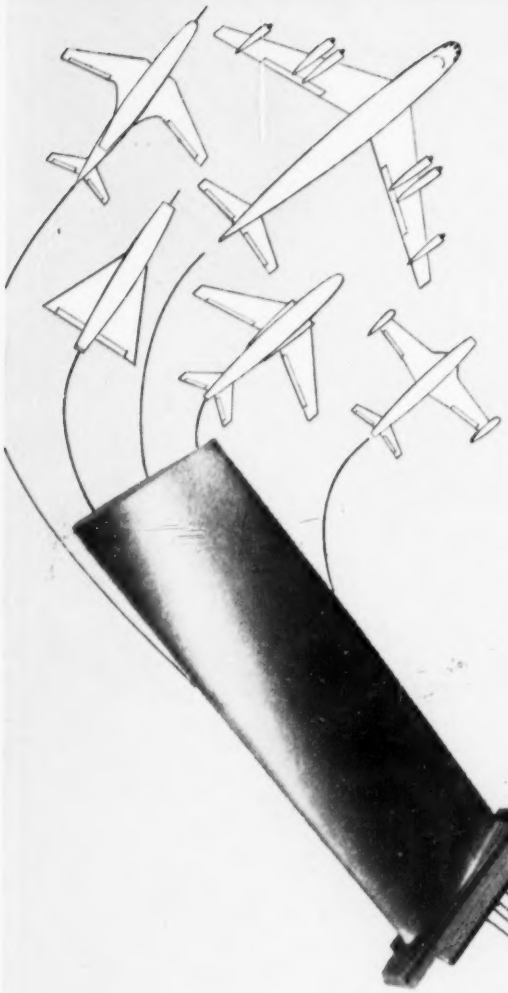
BULLARD

COMPANY

BRIDGEPORT 2, CONN.

PHONE 6-2511

JET PARTS PRECISION-FORGED ON *MAXIPRESSES!*



● **The forging of compressor blades and turbine buckets for jet aircraft engines demands the unparalleled ruggedness designed and built into the *new* MAXIPRES.**

For this reason MAXIPRESSES are being chosen for the vast portion of the American, Canadian and British jet forging installations.

These fine, newly redesigned, high speed forging presses, embodying 23 new features, are specially suited to the most difficult present-day work, and by the same token will be the most reliable forge-shop equipment for future use as well.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO—SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford **Detroit** **Chicago**

Stops tarnish on copper alloy jobs . . .

● Sciaky Brothers, Inc., Chicago manufacturers of spot welding equipment, were having trouble obtaining a suitable finish on certain copper alloy parts. After they were machined, parts frequently had to be processed to remove stain or tarnish.

Upon the advice of a Standard Oil cutting oil specialist, officials of this company put a STANICUT Cutting Oil to work on the troublesome copper alloy machining jobs. It was the end for tarnish troubles. On a wide variety of operations employing many different copper alloys, STANICUT has provided both superior finish and excellent tool life. Of further importance to this company, STANICUT is now used for all operations requiring a cutting oil. This has eliminated the cost and trouble of stocking and using several different cutting oils.

To help you get better cutting oil results, Standard Oil has a metalworking service that is unique in the Midwest. It gives you the metalworking products, the engineering service, and the supply service that fit your special operation and needs. The cutting oil specialist serving in your section of the Midwest will be glad to tell you more about this personalized service. You can reach this man easily by phoning your local Standard Oil office.

STANICUT
TRADE MARK
Cutting Oil

What's YOUR problem?

A. L. Seabaugh, who makes his headquarters at Standard's Chicago office, is the cutting oil specialist who recommended STANICUT Cutting Oil to operators of this midwest company and helped them solve a tarnish problem.

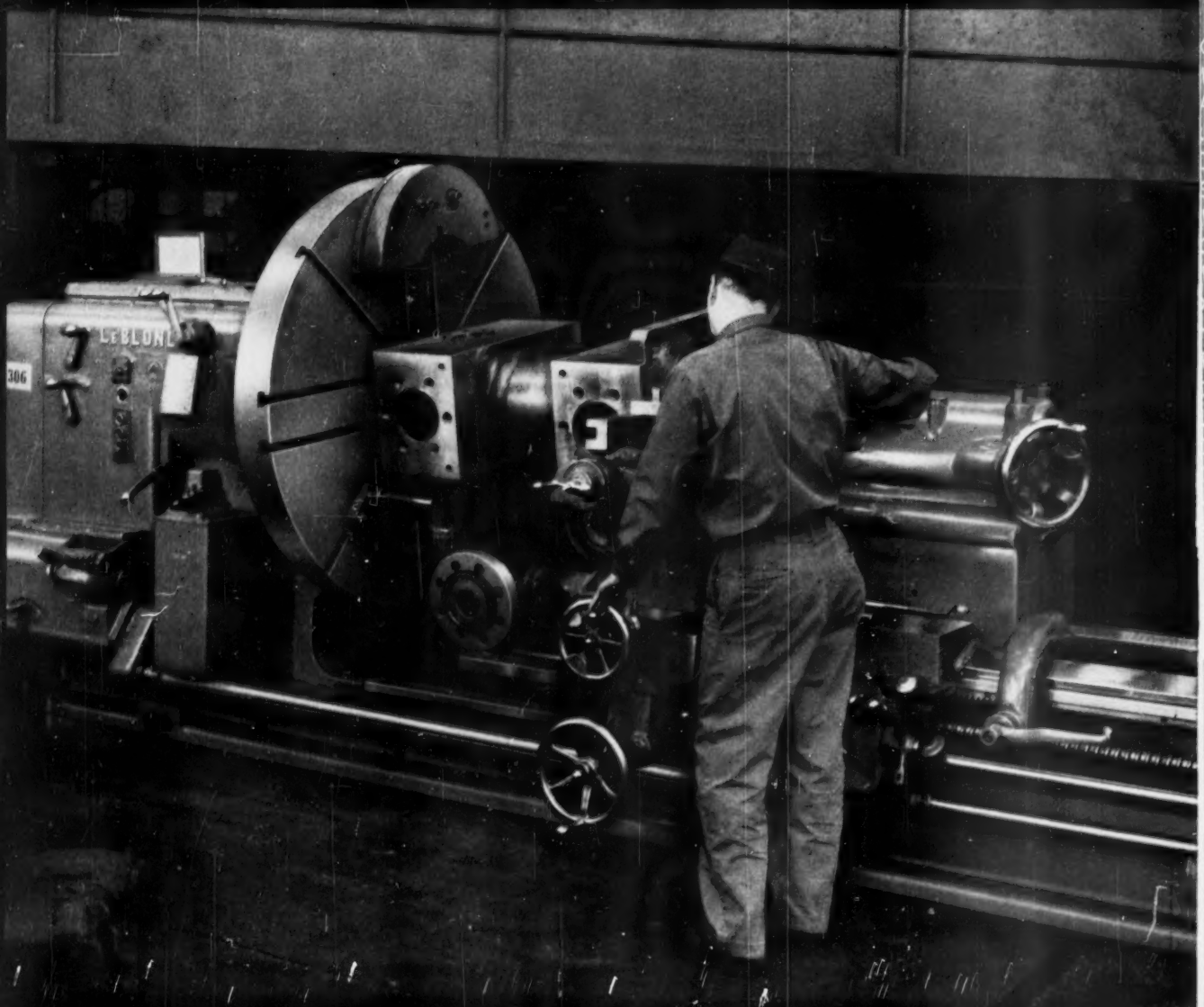
A. L. Seabaugh is one of a corps of able lubrication specialists who have headquarters in Standard offices throughout the Midwest. These men have been specially trained in Standard Oil Lubrication Engineering Schools and, in addition, have a wealth of practical experience. The specialist nearest your plant will work closely with you, giving you the help you need when you need it, to produce better cutting oil results. Phone your local Standard Oil office for his services.

STANICOOL HD Soluble Oil—Because it contains additional compounding, this heavy-duty soluble oil possesses not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

STANOSTAMP Compounds—Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work. These compounds can be removed readily in conventional washing equipment.

STANDARD OIL COMPANY **STANDARD** *(Indiana)*

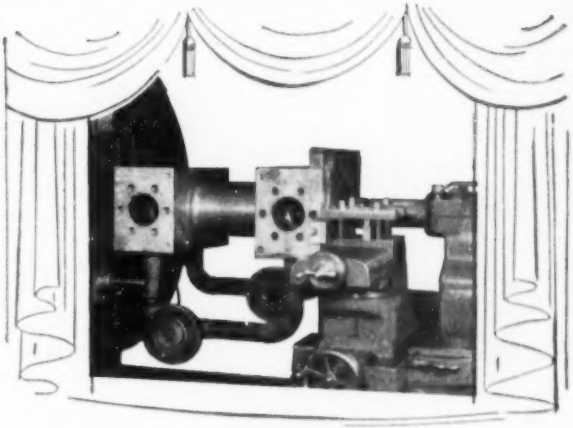
Le Blond Gap Lathe stars in 16-hour Variety



In operation shown, LeBlond 32"/60" Sliding Bed Gap Lathe is used to finish faces of compressor cylinder. Faces must be made parallel, square to bore. Extending manifolds require 78" swing. Job is supported on plug centers, weighs about 3 tons. Spindle speed, 76 rpm; feed, .010; 2 cuts; job time, approximately 110 minutes.

Show at Clark Brothers

Juggles Diameters From 6" to 78"
. . . Satisfies Critics
with Stellar Performance!



Clark Brothers Company, Olean, New York, had to "book" a one-lathe act—a single machine to turn out a wide variety of components for "Big-Inch" Type compressors. A special lathe for occasional large-diameter work was too costly.

"Talent scouts" at LeBlond's Buffalo distributor, The Buffalo Machinery Co., recommended their hottest variety number—a LeBlond 32"/60" Sliding Bed Gap Lathe.

Now this versatile machine performs 16-hours-a-day at Clark Brothers, takes the place of at least two machines. One specialty is truing-up and finishing heat-distorted compressor cylinders with manifolds already welded in place—faces must be made parallel. The sliding bed of the LeBlond Gap lathe opens up readily to meet the *78" swing requirement.*

With gap closed, it operates as a standard heavy duty engine lathe, turns power cylinders and cylinder liners *ranging from 6" to 30" diameters, requiring tolerances of ± .0015".*

The multi-purpose LeBlond Sliding Bed Gap Lathe is a sweetheart in the shop. Has adjustable gap and center distance. Four-way rapid traverse. Thirty-six spindle speeds are available, 5 to 500 rpm. Sixty feeds and threads. And, of course, you get all the well-known LeBlond features—hardened and ground steel bed ways, totally enclosed quick-change box, automatic lubrication, one-piece apron, thrust-lock tailstock and many more.

Whether your turning jobs call for versatility or production, heavy hogging or fine finishing, there's a LeBlond Lathe to turn them better, faster. Your LeBlond Distributor will tell you about the three Sliding Bed Gap Lathes, 16"/38", 25"/50", and 32"/60". Call him or write The R. K. LeBlond Machine Tool Company, Cincinnati 8, Ohio.

Ask for Bulletin SBG-103-A for more information on LeBlond Sliding Bed Gap Lathes.

Cut with Confidence

LeBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 66 YEARS*

Keep Your Eye on the OLIVER Line — Cost Cutting Production Boosting MACHINE TOOLS

OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers, with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½".

No. 510. For Drills ¼" to 3". 2-3-4 flute.

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model S-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

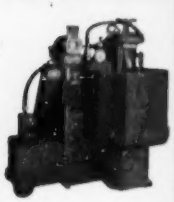
OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten-Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 12" dia., slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER



Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 1½" wide x 1¾" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten Carbide and high speed tools—offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

Write Today For Complete Information

OLIVER INSTRUMENT CO.

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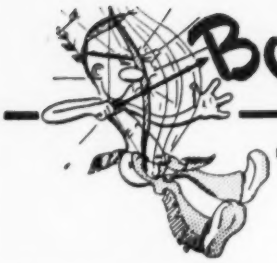

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

HOME BAKED—HALF BAKED

In a recent issue (*AM*—Aug 31 '53, p66) you have an article titled "Engineers Available." In another article (*AM*—April 27 '53, p117) you explain how hard it is to get good engineers.

I do not think these articles are fair to engineers in this country. There are plenty of good engineers here who are not very busy today. A number of the best engineers are in business for themselves and have a tough time getting work, as even the Government agencies do not list them and do not help them. The large companies given a government contract do not want to give the work to these small businessmen under the same conditions the government gave them the work.

In view of the above, please check and see who got the work out during our emergencies. It was the small businesses, or should I say, Engineering Offices, who designed and developed a number of items for the emergency. It was these small offices who threw rules and regulations out the window, cut red tape, and had the tools designed and made, and parts produced in World War II before mass production started.

"Good Experienced Engineers Short in the U.S.A."—Don't you think we should be ashamed of ourselves? Why is there a shortage of real engineers today? We have *more* engineers in the country today (maybe I should say "so-called") than ever before, yet probably 75% of these are not top men. They lack the practical experience necessary to real design or production work. I believe every engineer should have a college education, but he also needs the practical experience he does not get today.

Today, the college graduate is in demand. He graduates and immediately goes into a high-priced job. I do not blame him, but he would be worth ten times as much if he were to spend three or four years learning the real fundamentals. He knows theory, he has the ability to calculate, to talk and, one of the most important things, the abiility to meet and mingle with people of all classes. What he does not have is the basic training. You do not get this at school, only at work. This is where a man is made into a good engineer, or a so-called engineer. This is where

GRINETICS

BY D G SMITH

CHIP CONTROL

TERNE PLATE

ACTUATOR

CAP SCREW

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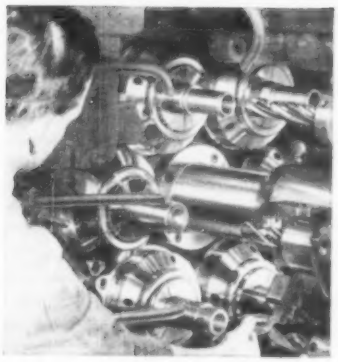


"He who makes no mistakes does nothing"

In a supposedly modern era it is sometimes claimed to be "smart business" to let a competitor take the lead and make profit from his mistakes. Obviously, if all business adhered to such a philosophy there would be no progress, if any business. "He who makes no mistakes does nothing". Cone leadership was founded — and is maintained — by active service, by doing things.

The Conomatic Carbide Development program expects to make a few mistakes. But, loss or gain, its efforts will contribute to the general benefit of all "automatic" users, users on whom all "automatic" builders are dependent.

The job illustrated compares actual production runs with HSS and 100% carbide tooling. It suggests the kind of pioneering that is being done at Cone. Full details are available.

MATERIAL—1112 STEEL: Hole drilled with 1" dia. drill to 2¼" depth. OD threaded to 2" length with 1¼"— 12 chasers.

	HSS	CARBIDE
Cycle Time	90 secs.	15 Secs.
Work Spindle Speed	370 R.P.M. at 103 S.F.	1500 R. P. M. at 417 S. F.
Tool Wear	1500 pcs. per grind	5000 pcs. per grind

Conomatic}

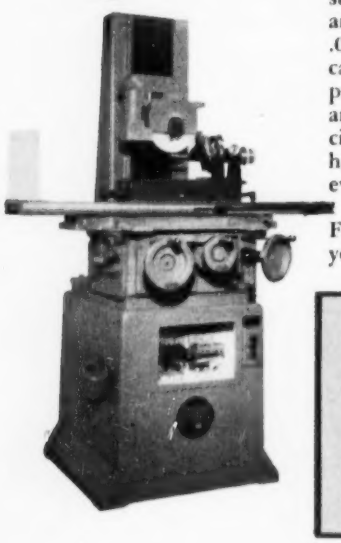
CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

You have precision at your finger-tips when you use REID GRINDERS

Every move counts, with no tiresome reaching or bending, when you operate a Reid. All controls are right at finger-tip level . . . always under your complete control, reacting instantly, without backlash or wheel play.

Such dependable performance, the result of Reid's built-in accuracy, insures precision to meet the closest tolerances. When the shop order reads .0001", put the work on a Reid and you can be sure that the finished piece will pass inspection. Reid Surface Grinders are designed and precision-built by specialists who put the results of over a half-century of experience into their every detail.

Find out the full story on Reid Features for Better Grinding: request your copy of Bulletin 618-1.



Elevating hand wheel, graduated in .0005"
Optional: Vernier, graduated in .0001", for elevating hand wheel
Cross feed hand wheel, graduated in .001"
Power feed (Model 618V), automatic adjustable cross feed from .006" to .100" at each reverse of table.
Table speed, 12-35 feet per minute
Work capacity: 6" x 18"
Table size: 51" x 8"
Standard wheel: 7" x ½" x 1¼"

Reid Brothers Company, Inc.

BEVERLY, MASSACHUSETTS

he learns to use his common sense. All the book learning in the world is of little value if a man does not have common sense.

About five months ago, I was at a dinner with an ME graduate who was talking about himself, not bragging, telling how good his education was, what he learned in college, and the things he could calculate, and how he knew where to look in books to find out what he wanted to know. This man has been out of college a few years, is no spring chicken, and has a very good position with one of our largest companies. I admire his ability to talk and mingle with people. I have worked as a consultant with him (not on the same payroll). His ability to calculate is amazing. I wish I could do the same.

In closing his talk, he made a surprising statement. This is, in effect, what he said:

"I am considered pretty smart, I know theory, I can calculate any job, and I have had a lot of practical experience. With all this knowledge there is one thing I lack. After I engineer a job, supervise the design, calculations, and detail drawings, the unit should work properly, but I cannot tell if it will or not. If it does not work, all I can do is check my work, and then experiment until it does. Why it did not work, I do not know. The thing I lack, M—has. He can look at a drawing and, before it is made, can tell you if it will or will not work. I have found him to be correct 9 out of 10 times. He cannot always tell you why it will not work, because figures prove it will, but when he says it will not work, do not make it. That is what I lack."

How many times do we hear in large companies as well as small ones? "He is a good engineer but he lacks experience?" How many times do we hear from the Chief Engineers and Chief Draftsmen? "I have so many men who call themselves designers, but are not even good detail men."

Instead of looking to foreign coun-

tries for our future engineers, why not give the young people a chance? Why don't we teach them? Why load them up with theory they do not know how to apply?

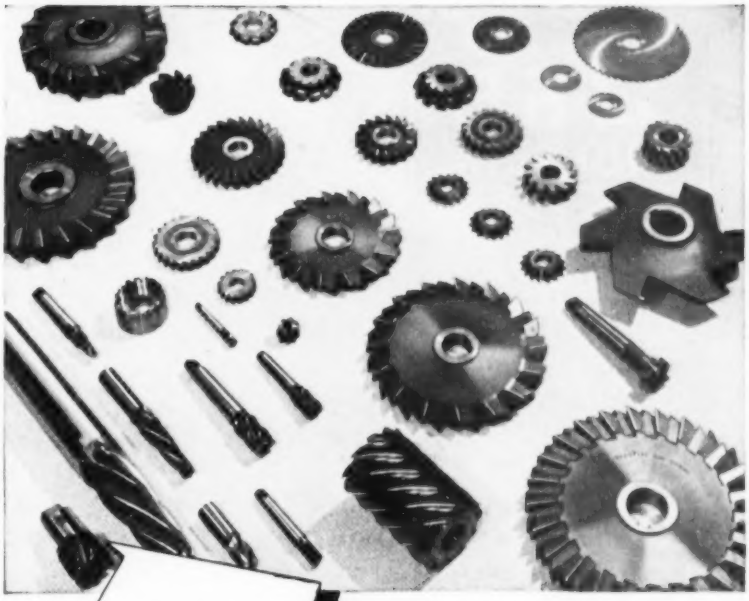
Just a short time ago one of our magazines ran an article on the training of engineers in Russia. We should be training our own people here in this country, not importing them. There is no call for it, nor will there be if we start to day.

Keep your shirt on, I am going to make a statement. "There has not been a real Tool Engineer trained since around 1930 in this country to any extent." Blow your top, say I am wrong, then stop and think. I do not mean that none has developed since that date. Prior to that date, a Tool Engineer had to know how to make a good looking, neat and accurate drawing. They do not learn this in school today. He had to know how to make a pattern. How many first-class machine and tool designers know that today? They ask the Pattern Maker, they do not tell him. The Tool Engineer had to know machine shop practice and had to be able to tell the toolmaker, diemaker, and machinist how to do his work. Let us be honest, how many times are parts drawn up today that can not be made? How many jobs are there working to tolerances either too tight, causing high cost, or too loose, causing sloppy fits? The Tool Engineer had to know tolerances and fits. He also had to know the kind and type of finish. Today, we give microfinish, double f and triple g. We don't care how they get it and the majority of shops do not agree.

I know these conditions do not exist in all shops but I think I am safe in saying they do exist in the largest percentage. I do not say the men in charge are not good men. As a rule they are tops, but they can not check every item themselves. It is the engineers who are tops today that have got to be replaced tomorrow. That is what we should be doing today. We should train new engineers from various walks of life to replace those who, I would say, have approximately ten more years of good engineering left.

I did not mean to write such a long letter, but I was very disgusted with the article. I think we should boost and help our own young people instead of always looking to foreign countries. I apologize to no one, as I can prove what I have written.

Nomas T. Reed
Chief Engineer
Reed Machine and Tool Engineers
Pawtucket, R. I.



THE *Complete Line*

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END MILLS AND MILLING CUTTERS

For profitable solutions to production milling problems, call on Gorham! Over thirty years' experience in creating fine cutting tools is your assurance of satisfaction.

An extensive line of *standard* end mills and milling cutters is stocked by Gorham distributors. When you need *special* tooling, a Gorham Field Engineer surveys your problem and makes design recommendations for a tool to be "tailor-made" for your application by skilled Gorham craftsmen.

Ask your distributor for Gorham "standards." For "specials," call in your nearby Gorham Field Engineer. They're both well qualified to help you . . . and backed by unmatched experience and facilities. For profitable solutions to milling problems, call on Gorham! There's no obligation.

Write for free 120 page catalog. Shows entire line, contains valuable engineering information.

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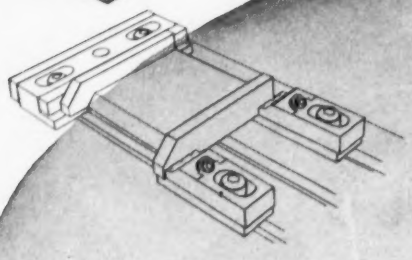
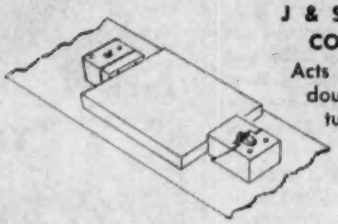


J & S DOUBLE ½ VISE
WITH MATCHING PARALLELS

- for unquestionable repeated accuracy
- for quicker set-ups
- for stronger grip
- for less obstruction

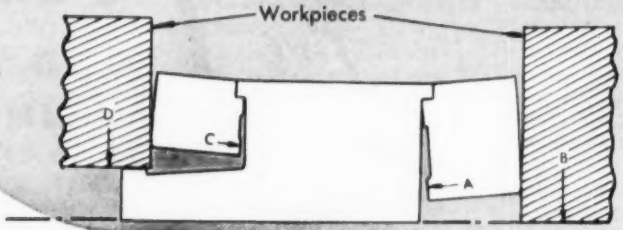
DOUBLE ½ VISE IN USE WITH ALL-PURPOSE JAW CLAMPS

for use on jig borers, millers, planers and shapers.



J & S DOWN-HOLDING COUNTER CLAMPS

Acts on same principle as double ½ vise (left). Fixture clamps operate on the same principle as the all purpose jaw clamps.



Hinged, Spring-Loaded Jaw Gives Positive Down-Holding Action

Hinged lip in-and-down action combined with in-and-down action of clamp holds workpiece against table and absolutely parallel. Construction is of oil-hardened tool steel, ground and blackened.

Jig Borers—quickly set up for jig-boring accuracy.

Millers—eliminates heavy miller vise and allows milling of more pieces.

Planers—eliminates strap and finger setups.

Shapers—eliminates vises.

Approximately 3 tons pressure closes Gap A, and approximately ½-ton closes Gap C—producing a down-holding action on each respective piece of approximately the same force.

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—contains complete details on advantages, applications, types and sizes available.

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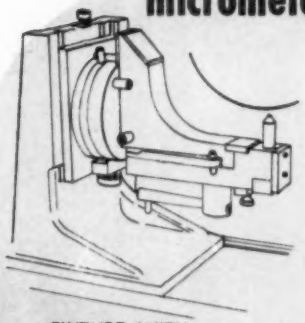
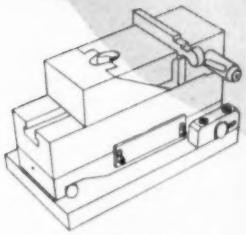
dress two angles tangent to a radius in one continuous motion

High-Carbon, High-Chrome Construction

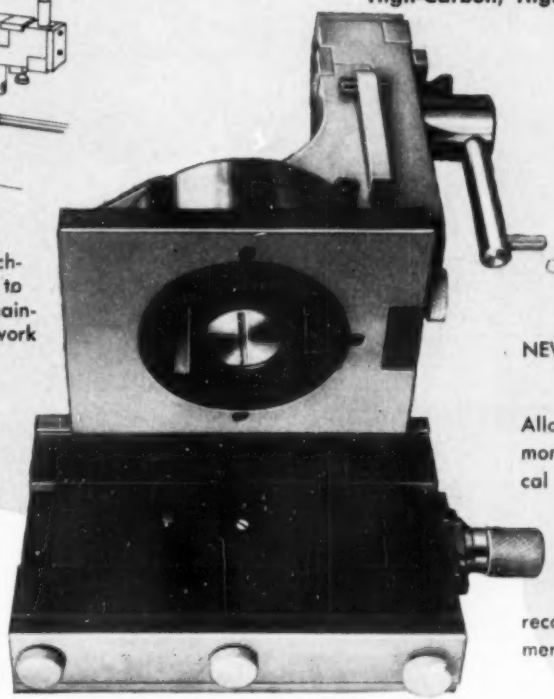


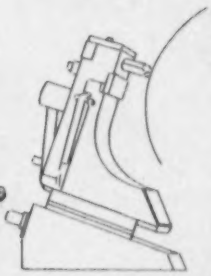
FIXTURE WITH MICROMETER FEED

Under the wheel attachment makes it possible to dress under the wheel, maintaining any desired work height.



Precision Grinding Vise with or without sine bar allows rapid unloading and exact relocating.





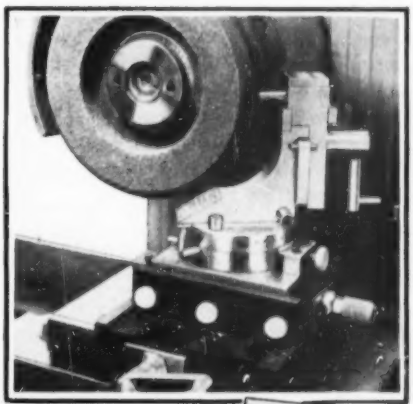
NEW SOLID ANGLE RAMP WITH MICROMETER LEAD SCREW

Allows fixed position of diamond when used in cylindrical grinding for dressing above the center line, but coincidental with the center line of the wheel. Factory will recommend proper equipment on request.

Adaptable to All Types of Cylindrical and Surface Grinders

By loosening gib, dresser can be removed from the micrometer "C" Base and affixed to solid or adjustable angle ramp for cylindrical grinding. For surface grinding the dresser is returned to "C" Base.

Photograph on right shows special compound base with micrometer lead screw having travel in four directions. Dresser usually is furnished with extra stops for zero setting.



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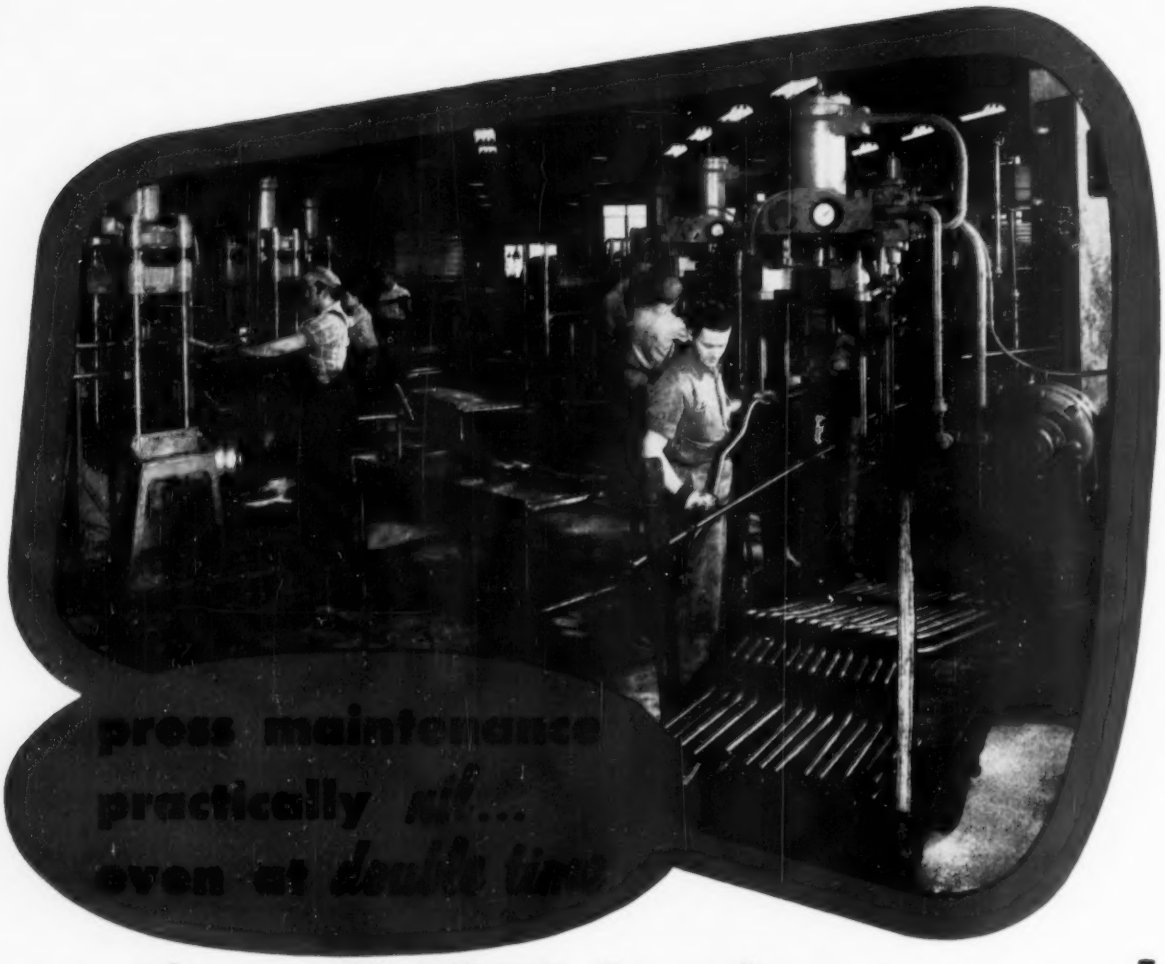
A variety of models and attachments to suit your needs. Write for free catalog covering dressers in detail. J & S also manufactures a complete line of All-Purpose Jaw (machine) Clamps, Vises, and Special Tools. Write for Machine Shop "Time Savers" booklet.



on these ELMES bending presses!

Six out of ten Elmes® Hydraulic Tube Benders in operation at Tube Products Corporation, Tipp City, Ohio, are shown above. Used for forming exhaust and tail pipes for automobile, airplane, and diesel engines, these six presses have been in service for four years; the remaining four Elmes presses, not shown, have been in service for eight years.

"These ten presses are in constant operation at least 8 hours daily," says Mr. E. C. Sonnanstine, Tube Products' executive vice-president. "In fact, at least 50% of the time they are in operation for 16 consecutive hours. Yet with all this heavy-duty operation, practically *no* maintenance has been required—only normal replacement of worn gaskets.

"We feel that the use of this equipment, with its simple tooling and exceptionally high operating speed, enables us to produce in quantities a quality product at the lowest possible cost to our customers."

Elmes Hydraulic Metalworking Presses have an enviable reputation for *maintaining* high production . . . because Elmes *builds* performance into its press designs . . . the kind of performance that only 102 years of specialized engineering experience can produce. Whatever your press requirements—for drawing, forming, straightening, bending, hobbing, forcing, etc. — let Elmes' long experience be your guide to better, faster, lower-cost production. Press recommendations and cost estimates are yours for the asking.

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SPOT NEWS of Metalworking

- **Production, transportation, distribution and servicing of capital goods** and allied industrial equipment runs $54 billions a year and accounts for 18.5% of the nation's industrial output, according to a study made by the Council for Technological Advancement. Capital goods industries employ 8.1 million.

- **Titanium 12-pt double-hex nuts with nylon locking inserts for airframes** are now commercially available in sizes from 5/16 to 5/8, with other types to come. Advantage: titanium locknuts meet military tensile strength specifications for steel nuts of same thread size, weigh half as much, resist corrosion.

- **Auctioned White Motor Co machine tools brought extremely high prices** recently. Some 300 firms bid as high as 80% of original cost for big punch and shear presses — had to move them away, too. Reason for the high bidding: current 7-8 month delivery lag on new large presses.

Screw machine products industry is afraid big manufacturers (autos, appliances, etc) will take their screw products business back into their own captive plants — the usual trend when business falls off. It last happened in 1946, when large car and appliance firms bought up surplus equipment, formed their own screw machine products divisions or departments.

- **Research and development of metal borides for high-temperature applications,** both civilian and military, is being undertaken jointly by Carborundum Co, Firth Sterling, Inc, and American Electro Metal Corp.

- **Air conditioning system for mothballed stand-by defense plants** is now on the market. Adiabatic system maintains 35% relative humidity at temperatures as low as 20 F, can also humidity-condition underground storage spaces.

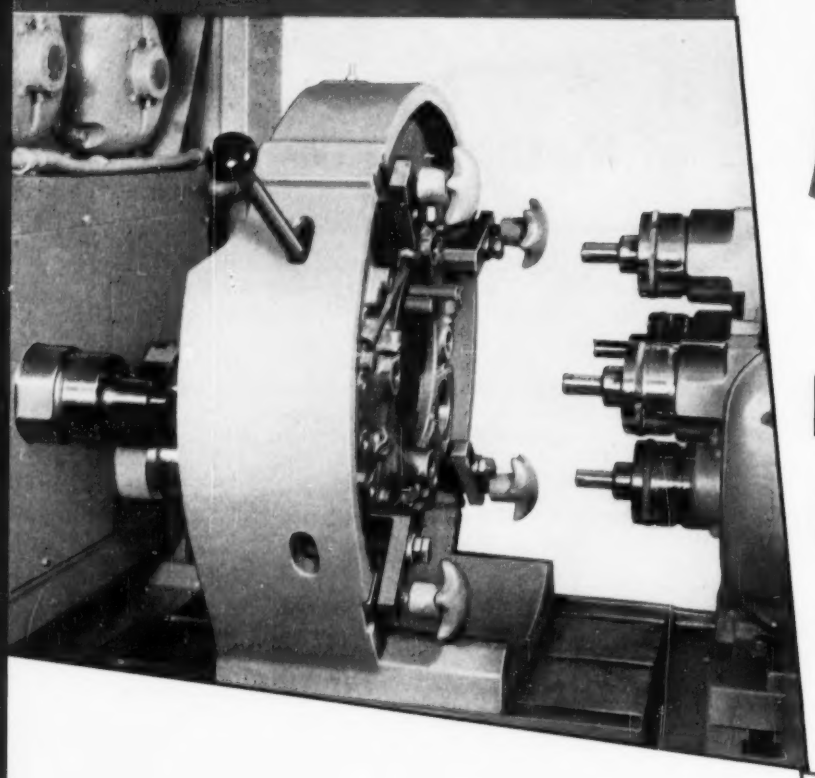
- **Corrosion and fatigue resistant alloy developed originally for mainsprings** of watches is now commercially available for production of parts requiring similar spring characteristics. Properties: high elasticity and tensile strength. Can be welded, brazed, punched, formed, soldered, and machined with carbide-tipped tools.

- **High-helix carbide-bladed cutters are slashing milling time at Convair.** 150 spar caps are milled in 16 hr instead of 48, with feed tripled to 300 ipm at 3600 (7/16x2 7/8-in. cut). On end-milling job, cost was cut from $3 each with an HSS straight-flute cutter to 19 cents with a helical carbide one.

Critical list of machine tools, with the possible exception of jig borers, jig millers and jig grinders, is about to be abolished. This action will be embodied in an amendment to NPA's M41, which also will reduce required set-aside of machine tools for rated customers from 60% of total to 40%. See page 87.

- **German tool and die manufacturer is seeking US orders for lamination dies** at lower prices than American companies can quote and is promising 8 weeks' delivery — and payment need be made only after samples have been approved.

- **Chevrolet believes that 1954 auto sales will make it the third best year** on record (5.3 million to 5.6 million passenger cars). There probably will be a shift in buying toward lower-price cars, which formerly comprised 60% of total sales, compared with 54% recently.



Another Way!

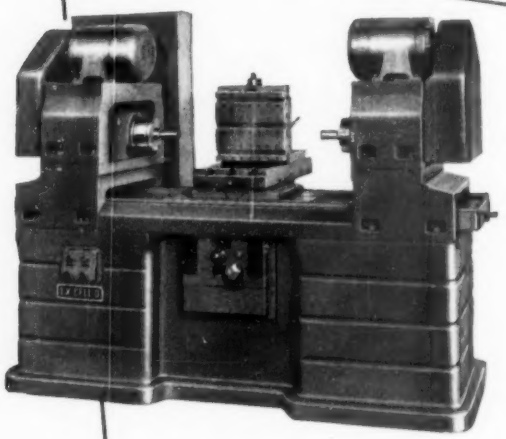
Relation of 7 Bores Held to Close Tolerances

The standard Style 17 Ex-Cell-O Precision Boring Machine shown above is equipped to finish-bore seven holes in a magnesium supercharger support. An individual spindle and a two-spindle cluster at the left end of the machine finish three holes, then four individual spindles at the right end finish the remaining holes—*all during one automatic work cycle.*

Bore diameters are held to plus or minus .0005"; relative location of holes is plus or minus .001".

* * *

Call your Ex-Cell-O representative for complete information; or write Ex-Cell-O for Catalog 31205, with the complete story of Ex-Cell-O Precision Boring Machines.



The Style 17 is a rugged, double-end precision boring machine for accurate boring, turning and facing operations on medium-size and large workpieces. Shown above with Universal Fixture.

XLO

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CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
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53-20

Washington

There are auto sales — and prosperity for the metalworking industry — in a new money policy that's been adopted by the administration and the Federal Reserve Board.

It's designed to guarantee that there will be no depression for lack of an adequate supply of money and credit to sustain a continually expanding US economy. What it means to business is this: next year the government's policy is to pump something like $3.7 billion dollars, more or less, into the stream of business.

The theory is that the US economy needs a certain volume of dollars and credit to sustain its growth — and that failure to expand the money supply to keep pace with business needs could trigger a recession.

General Motors officials — and other auto executives, too — are happy over this decision. They think it guarantees that the administration, while fighting inflation, won't inadvertently take us into a deflation through a shortage of money and credit.

The idea is not new. It's been floating around for years. But from here on out, the plan is to deliberately increase the nation's money supply by an amount to be decided by the Federal Reserve every six months or so. Next year, it's around 3% of the money supply.

• • •

Vance Plan for reserve tools is still not definite. The deadline for the military services to submit reserve tool requirements to Assistant Defense Secretary Thomas is December 28. By that time the Army, Navy, and Air Force are supposed to have worked out requirements for reserve tools that they will need in case of all out war. The hitch is that they must confine their requirements to the total funds allowed by Congress — some $250 million or about half the figure Studebaker President Harold S Vance said was necessary.

The big hassel in the Pentagon is how to split up the pie. Each service would like to claim a lion's share of the reserve tool money. But the requirements have to be okayed by supply and logistics boss Thomas. He has already turned down one Air Force proposal that would have resulted in leaving a little more than $50 million to be spent by the Army and Navy for excess tools in case of war.

Not all the money is for tools, though. Part of it is supposed to go for the purchase of existing plants when it looks like they are about to be channeled into some other industry that would result in their loss for mobilization production purposes. The exact amount of funds going into this category is not specified. But construction and acquisition of plant facilities, including warehousing, is not supposed to exceed $50 million, leaving the balance for tools.

Thus far, not one cent of the money Congress voted for reserve tools has been allocated or let in contracts. But the appropriations were written in such a way that the money is good on the books until expended.

Chances are that the services won't begin letting contracts for Vance reserve tools until some time in the late spring at the earliest. Even then, the program will be slow and cautious.

• • •

ODM has formally closed expansion goals for 120 defense industries. There were originally 237 goals. Among those closed are these heavy goods industries: chemical and mining machinery; copper foundry, wire mill, and brass mill facilities; ferro-alloy blast and electric furnaces; heavy metal tanks; materials handling equipment; power crane and shovels; steel ingots; hydraulic turbines. This means no more accelerated tax amortization will be granted for expansion of these facilities.

• • •

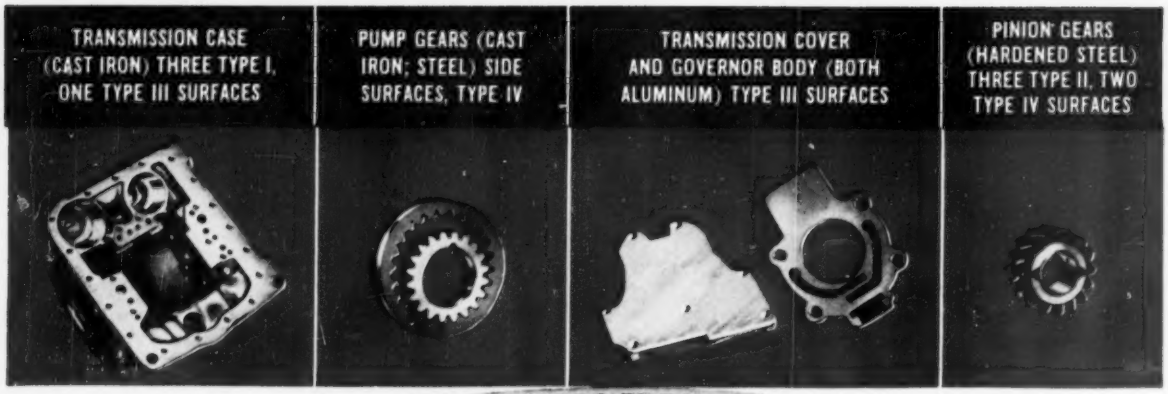
Fast tax writeoffs will be definitely issued for expansion in only 68 industries. These are the capital goods industries for which the government still seeks the most expansion: aluminum sheet and plate heat treating facilities, freight cars, gas pipe lines, heavy aluminum aircraft forgings, ocean-going and inland-waterway vessels, diesel locomotives, scientific instruments, steam turbines.

ODM officials frankly say most of these goals are academic only. While the government would like to see expansion in these fields, fast tax writeoffs have proven to be inadequate expansion incentives. Whether other incentives will ever be offered is problematical.

• • •

Forty-nine goals have been "suspended." This means tax certificates are being scrutinized with a fine tooth comb, even though goals have still not been achieved. In this category are the following goods for which BDSA's Metalworking Equipment Division is claimant agency: abrasive products; dies, jigs, and fixtures; elephant tool manufacturing facilities; machine tools, metal cutting tools, miscellaneous metalworking equipment, and presses and forging equipment.

On the average, these production equipment goals are already 90% achieved, although elephant tool and press and forging equipment goals are less than 65% achieved.


TRANSMISSION CASE (CAST IRON) THREE TYPE I, ONE TYPE III SURFACES
PUMP GEARS (CAST IRON; STEEL) SIDE SURFACES, TYPE IV
TRANSMISSION COVER AND GOVERNOR BODY (BOTH ALUMINUM) TYPE III SURFACES
PINION GEARS (HARDENED STEEL) THREE TYPE II, TWO TYPE IV SURFACES

FOR PRECISION FINISHING OF FUNCTIONAL SURFACES

PowerFlite transmission parts are *Microhoned*

Chrysler engineers, with years of proficiency in production-processing of precision parts, have specified the Microhoning process as the method for obtaining

✶DIMENSIONAL ACCURACY ✶GEOMETRIC PRECISION ✶CONTROLLED SURFACE FINISH

required for the efficient functioning of the new PowerFlite transmission.

FOUR TYPES OF SURFACES IN THE *PowerFlite* ARE MICROHONED:

Type I—Cylindrical surfaces through which a piston or valve moves.

These surfaces must be round, straight and accurately sized, with a controlled surface finish—in order to minimize wear and eliminate oil leakage. The Microhoned finish assures non-flaking surfaces between the stationary and moving parts.

Type II—Cylindrical surfaces in rotating parts.

Microhoning maintains concentricity of pitch diameter of teeth and the bore of gears, permitting teeth to mesh with minimum noise and wear. The bore must have precise geometry, size, and functional finish to retain a lubricating film at high speed.

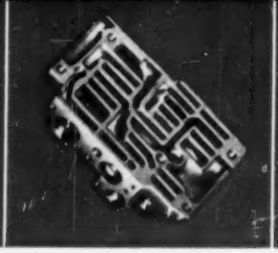
Type III—Flat surfaces that are bolted together without a gasket.

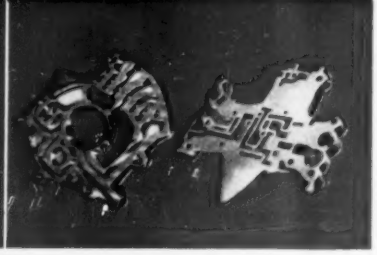
They must be flat enough so that they will not distort when pulled together, and must have a surface finish that will mate to form a tight, effective seal.

Type IV—Flat surfaces that move in contact with stationary surfaces.

These must be smooth and flat in order to minimize friction and wear, and maintain a "running seal", thus eliminating leakage.

For more information on the Microhoning process write to:
Field Engineering B7
Micromatic Hone Corporation
8100 Schoolcraft Avenue
Detroit 38, Michigan





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REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

Detroit

Scarcely a month can slip by anymore without being crowned by Ford as a record sales or production period.

Latest claims: More new Ford cars were sold last month than in any November since 1925; more new trucks were sold than in any November in company history; more new Mercurys were sold in October than in any month in history.

All these records will be topped next year, judging from comments by Henry Ford II and Ernest Breech, executive vice president. Ford said the company will produce more cars in 1954 than in any other year. Breech said heavy overtime schedules will prevail during the first quarter and probably for some time thereafter.

If the company does in fact break its car production record, it will have to go over 1,825,766 units, that being the record number of Model T's and Lincolns produced in 1923. In the first 11 months of this year, the company built almost 1.5-million cars and nearly 300,000 trucks.

• • •

While Ford's plans for 1954 represent imposing threats to competitors, General Motors gives no visible indication that it is disturbed.

To say that public utterances by GM officials reflect smugness would be overstating the case, but certainly they suffer no lack of confidence. Some outsiders, in fact, have concluded that GM may even make an effort to take at least half the new car market next year, a bold move considering possible anti-trust repercussions.

That is pure speculation; planning will not be evident until GM's Motorama opens in New York next month. Harlow Curtice, president, can be expected to outline the corporation's 1954 program then.

If all its divisions were to aim as high as Buick, GM almost certainly would make a very stiff fight for more than half the market.

Ivan Wiles, Buick general manager, said his division hopes to sell at least a half-million of its handsome new models, as against 1953's anticipated sale of 480,000.

• • •

Anyone who still thinks auto optimism is unrealistic should measure depth of the potential auto market in terms supplied by the Automobile Manufacturers Assn. AMA estimates tnat about 28% of the 54.7-million vehicles presently registered in the US are at least 11 years old.

The industry builds its cars and trucks well, but doesn't build them to last forever. The replacement market appears to be tremendous.

And one of the most respected sales executives in the industry, when asked to estimate how far 1954 sales would fall below 1953 figures, countered about like this: "Do sales have to be down? Instead, tell me why sales can't be higher?"

That might be chalked off as typical sales talk were it not for the fact that this executive has established in recent years that his economic forecasts are reliable and accurate.

• • •

Chrysler's new Powerflite transmission plant in Indianapolis is the sole automatic transmission source for all Chrysler, DeSoto and Dodge cars.

If this rings a bell, it may well be an echo of the fire alarm bells heard in Livonia last August when GM's transmission plant burned.

Dodge officials who operate the Indianapolis plant figure it is less vulnerable than was GM's, however. Instead of wood block, the floor is bare concrete. Instead of very limited overhead sprinkler coverage, every area in the plant is covered, except the space occupied by the heat-treat department, where a burst of cold water, of course, could be calamitous.

Nevertheless, a second source will be established, probably at Dodge main, Detroit.

• • •

After years of tight steel supply, auto officials obviously are relishing present plentiful supply. James J Nance, Packard president, after noting that the sales manager of a large steel company had phoned to say he intended to call on Nance "merely to visit," commented: "That is the first time that's happened to me since 1946."

The degree of change Nance has wrought at Packard during his brief reign, incidentally, is aptly portrayed in these figures: A year ago, the top 26 executives of the company averaged 59 years of age. Today, the average is down to 46 years.

• • •

Detroit labor relations directors will be taking careful note of proceedings at the CIO United Auto Workers' Education Conference next April.

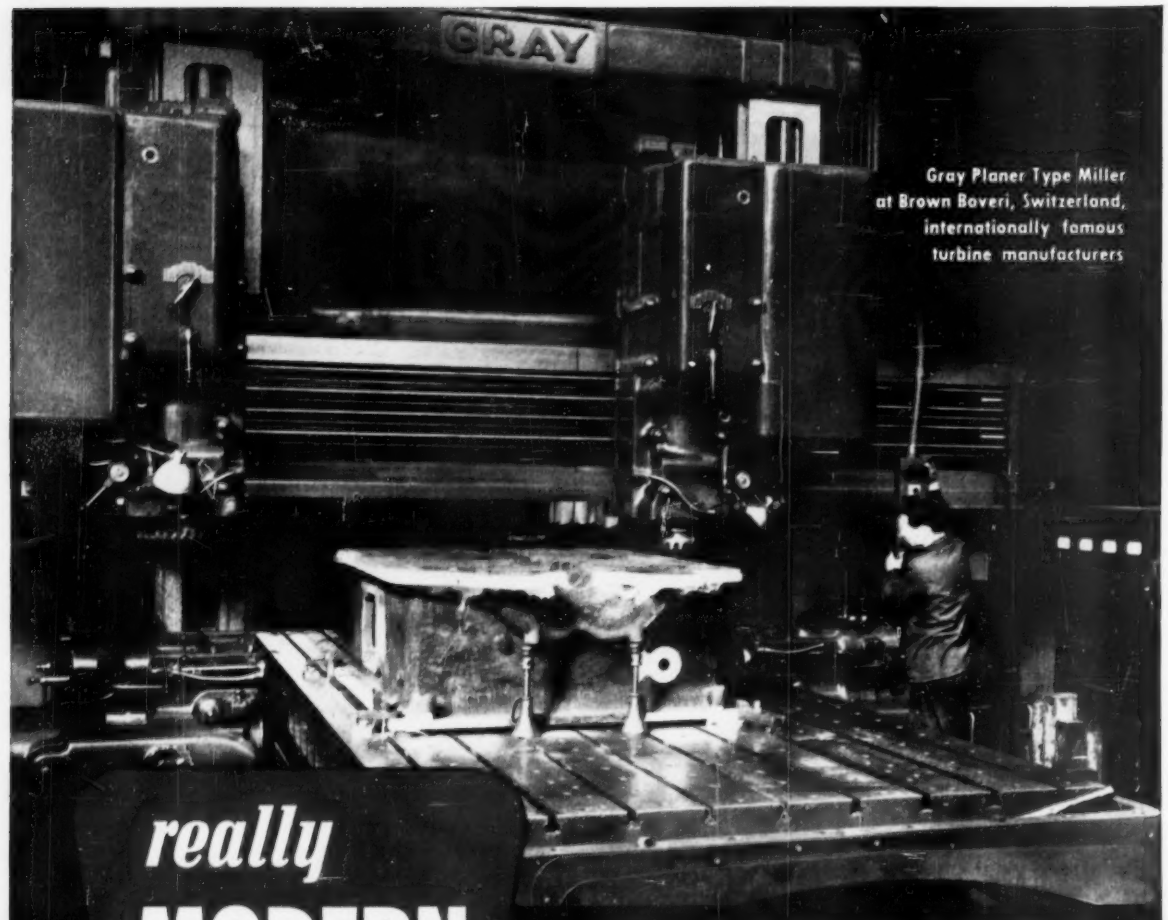
Reason: Guaranteed annual wage discussions will be high on the agenda, may, in fact, give the first solid clues as to the specifics of the plan UAW intends to set before auto companies.

To date, UAW has no final plans. The union will present its latest thinking to its public advisory committee soon after the turn of the year. Following custom, the committee will look for flaws that management might also be expected to uncover, then UAW again will go to work to pull in loose ends.

Model changeovers and holiday schedules cut weekly car and truck production figures back going into December, but even so, *Ward's Reports* pinpointed December 8 as the day when the 7-millionth assembly of 1953 was achieved.

• • •

Chrysler is certain to establish its historic high in auto production this year. Early in December, the corporation needed less than 50,000 units to equal 1951 production of 1,233,294.



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Machine Tools

An amendment to NPA's Order M-41 is about to be issued reducing the ratio of defense-rated deliveries of machine tools to the total from 60% to 40%.

This recommendation was made by the Machine Tool Industry Advisory Committee on October 20 when it met in Washington.

The critical list of machine tools will be abolished at the same time, except possibly for jig borers, jig grinders and jig millers. There is even a question whether any exceptions will be made at all. The present freeze period of 60 days will be kept without change.

The Business and Defense Services Agency may have put the M-41 amendment into effect before you read this page.

• • •

Three recent orders of the Office of Defense Mobilization are to be rewritten into one order.

They are: (1) ODM-18 governing distribution and use of idle government-owned machine tools; (2) ODM 7-4 covering the leasing of such machines, and (3) ODM-24 establishing a board to consider what to do about privately-owned defense facilities for emergency use.

Rewriting is being done by BDSA, Defense Dept, GSA and Small Business Administration.

Provisions against leasing idle government machine tools for civilian jobs are said to have piled up at Pentagon. Action on them will set the pattern for the future.

Observers are fearful that the Defense Secretary's office will approve these applications and put the heat on ODM Chief Arthur Flemming to give his blessing.

• • •

Machine tool sales are lagging behind the volume earlier in the year. The downtrend probably will continue into the New Year.

Builders are hopeful, however, that demand will turn up in the first quarter. Inquiries are plentiful and, on the whole, are for single machines or for two or three machines at best. They are widespread geographically and by metalworking classification.

Builders are turning their attention more closely to replacement markets, as revealed by the seventh *American Machinist* Inventory of Metalworking Equipment, recently published.

• • •

Automotive companies still are to buy considerable quantities of machine tools for expansion or for tooling of 1955 models.

One large maker expects to order machines to enlarge its engine manufacturing capacity.

• • •

Joseph Owens, Jr. has taken over as branch chief of the Metalworking Equipment Division of BDSA. He is responsible for the duties formerly handled by James Lawson of the Norton Co and Victor Rigotti of the Sundstrand Machine Tool Co. Mr. Owens is general manager of the J F Owens Machinery Co, Syracuse NY distributor of machine tools.

• • •

Lease of 116 Army Ordnance-owned machine tools to Brunswick Ordnance Co, subsidiary of Mack Truck Co, has been approved by ODM.

Agreement runs until June 1954. Tools are to be used to make parts for new automatic gear shift on subcontract from Ford. Business and Defense Services Administration unsuccessfully objected to the leasing decision.

Ford has similar new tools on order and expects to have them installed in one of its own plants before the government's leasing agreement with Mack expires.

ODM officials say the Mack-Ford lease is not to be interpreted as a precedent for similar rentals of idle government-owned machine tools.

Washington reports have it that ODM reluctantly gave its blessing to the transaction after Deputy Defense Secretary Roger Kyes, former General Motors vice president, personally intervened on behalf of Ford and Mack.

The 116 tools being leased are part of a 540-tool production line being maintained on standby for Army Ordnance at Mack's Brunswick plant. The machines are mostly gearhobbing and grinding machines being kept as a package for manufacture of tank gear components.

Ford and Mack have agreed to maintain the entire 540-tool production line for the government without charge during the period of the lease.

What observers fear most is that this deal will set a precedent whereby political pressure will be use to approve the leasing of government-owned machines for civilian output.

• • •

The fourth European Machine Tool Exhibition will be held in Milan, Italy, September 14-23, 1954.

It will be organized by the Italian machine tool builders' association—UCIMU (Unione Costruttori Italiani Macchine Utensili), one of the four sponsoring national trade associations.

Almost all Italian builders will take space. Heavy German participation is expected.

At Milan the British will be one of the official sponsors of the European Show for the first time.

The European Committee anticipates that American representation at Milan will be greater than at Brussels, when 25 companies displayed.

BF

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New Grade 370 Carboloy cemented carbide cuts more cubic inches of steel per minute – with longer tool life – than any existing carbide. The first of the new Series 300 cemented carbides, Grade 370 was specially developed for taking heavier cuts in steel at higher speeds than ever before practical.

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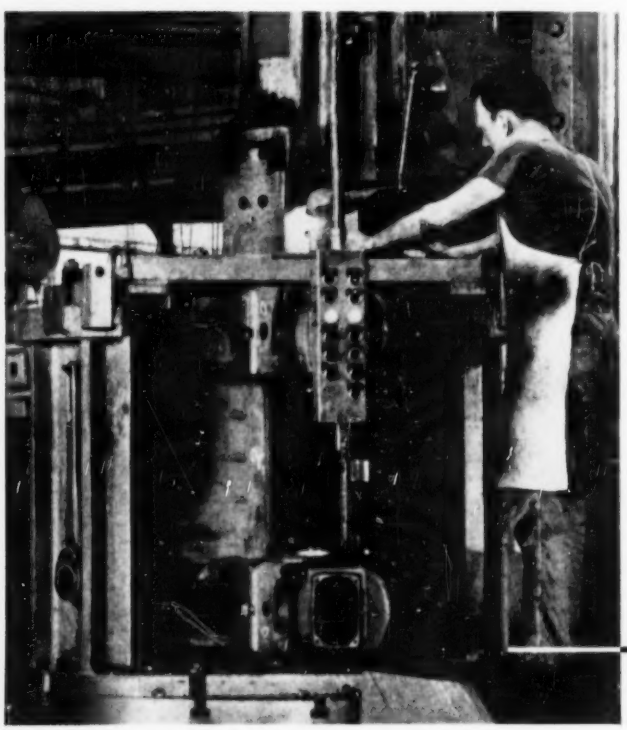
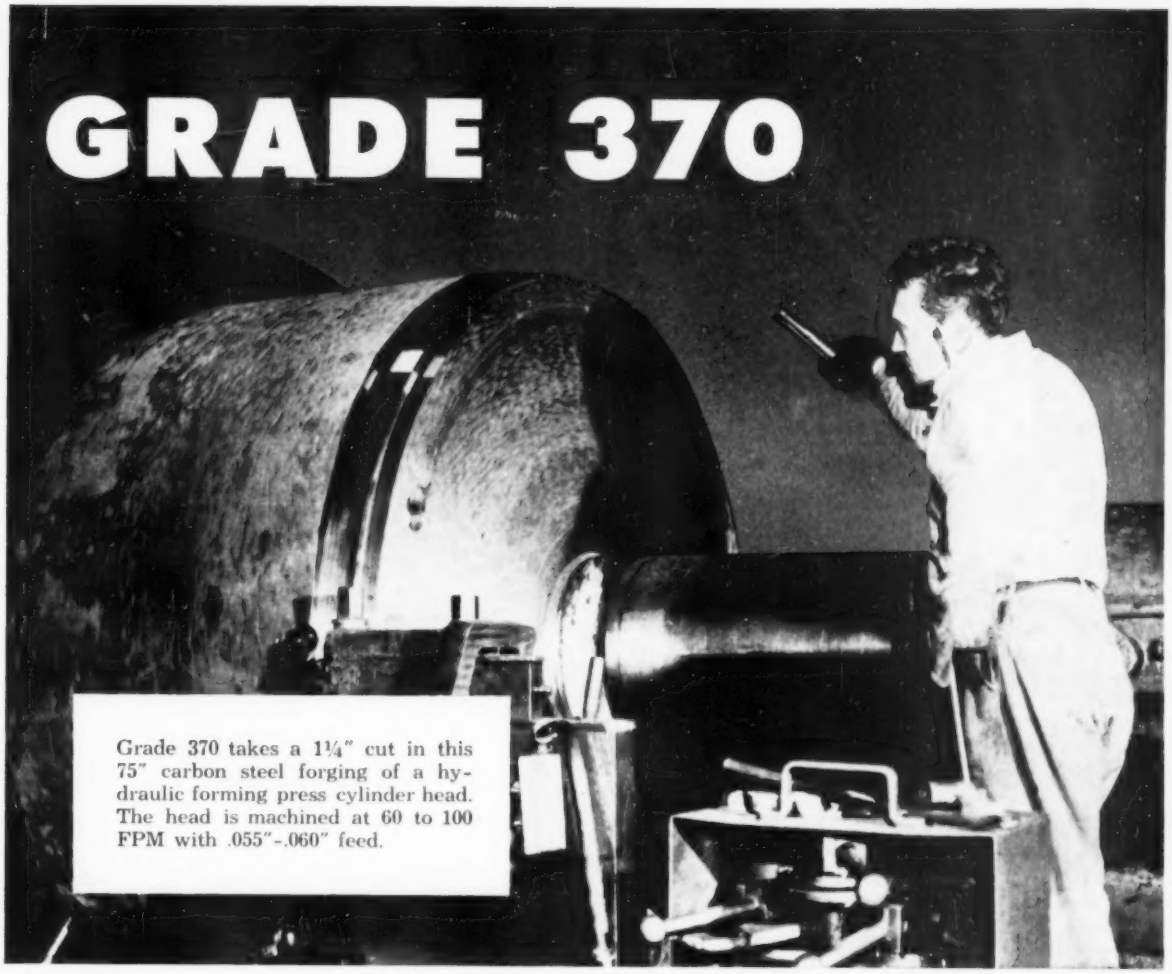


Close-up of cylinder head forging. Grade 370 cuts large chips and withstands the tremendous pressure and temperature without deforming. With Grade 370, both machine downtime and tool cost per cubic inch of steel removed were substantially reduced.

Vertical mill taking ¼" to ¾" cut in an alloy steel casting for a traction motor frame. Grade 370 machined 70 FPM with .060" feed . . . and resulted in a reduction of tool costs of approximately 10 to 1 over other carbides.

GRADE 370



Grade 370 takes a 1¼" cut in this 75" carbon steel forging of a hydraulic forming press cylinder head. The head is machined at 60 to 100 FPM with .055"-.060" feed.

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DEPARTMENT OF GENERAL ELECTRIC COMPANY

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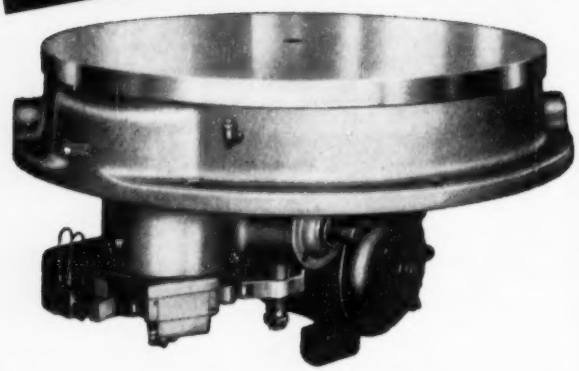

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Semi-skilled operators will deliver high production accurately and efficiently, yet with a minimum of supervision.

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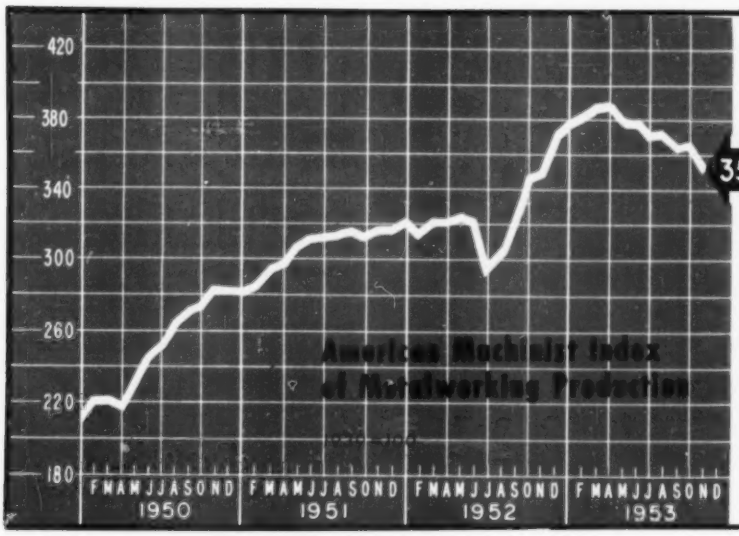
Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	NOV '53(*)	OCT '53(p)	SEPT '53(r)	OCT '52
Tot. Index	352	354	356	343
Machinery	313	315	309	
Electrical Machinery	413	418	398	
Autos	267	269	253	
Other Transportation	599	599	566	
Other Metalworking	352	354	346	

(*) Estimated (p) preliminary (r) revised

Metalworking production is continuing slowly to settle down onto a lower level.

The retreat is orderly and without alarm. It is characterized by reductions in hours worked, in the elimination of overtime, in small layoffs of workers, in shorter deliveries quoted on orders.

Incoming business is consistently running behind production. It has been for some months and probably will continue to do so in the next quarter.

Manufacturers are more cautious in their actions and predictions. They are watching their inventories and actually reducing them wherever they can. Many steel customers have refrained recently from ordering more tonnage until they could pare down stocks on hand.

Yet one should not get the false notion that things in Metalworking are "going to pot." They aren't.

Operations, based on manhours worked, are up around 3½ times the prewar rate. That volume was exceeded only in the superboom period the past year, and during World War II days.

• • •

Defense production schedules are being shaken down a bit. But they still are big.

Aircraft parts makers seem to be set through the first quarter and perhaps the first half without any significant slackening of the current pace. They are understandably hazy in guessing farther ahead.

Automobile assemblies recovered somewhat this month from the sharp drop in November. What's more, Detroit bigwigs are now talking in terms of a whopping first quarter, spurred by the bitter General Motors-Ford rivalry and the desire to stock dealers amply for the spring selling season.

• • •

Stamping shops are doing about 16% less business than a year ago. Biggest drop has been in the automotive field, but a pick-up is promised once the new models are introduced.

Part of the decline has been cushioned by continued good volume from the appliance industry.

Stamping volume has been holding fairly evenly the past three months.

The drop forge industry reports a sharp gain in orders, just the reverse of what happened in the early fall.

Now the forge people have comfortable backlogs for 5-6 months, compared with three months before Korea. Shipments are at the early 1953 level. Production will be at or close to full capacity right through the winter.

Shrinkage in business next year won't be more than 10% if that much, forging shops figure.

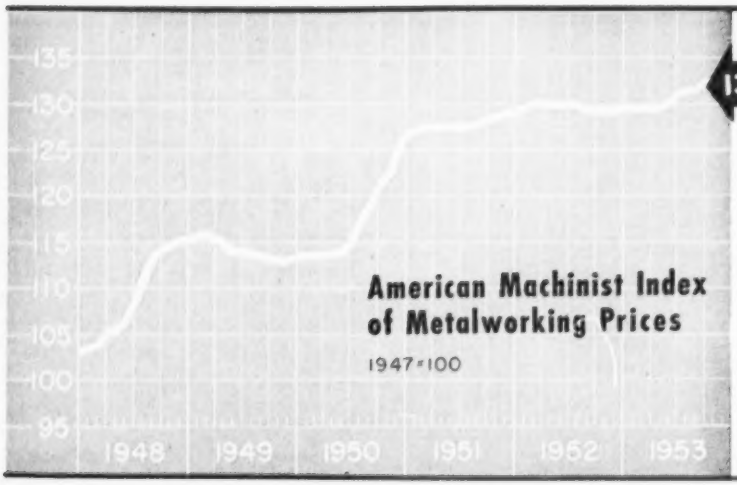
Makers of industrial fasteners say that the 1953 production rate will prevail up to the middle of next year. Latest monthly figures reveal that sales are off 12% from the first quarter's record volume but shipments are off only 6%.

• • •

The steel situation has become highly competitive with mills scrambling for business. Warehouses have plenty of inventory on almost all items.

Customers are working off steel stocks to get them down to normal. By year's end or early in the first quarter, many users will have completed this readjustment, will be back in the market.

Gaging Business



PRICE INDEX

132.6

	NOV '53(*)	OCT '53(p)	SEPT '53(r)	OCT '52
Total Index	**132.6**	**132.6**	**132.5**	**129.6**
Metalworking Machinery	**141.7**	**141.8**	**137.9**	
Other Machinery exc. Electrical	**137.1**	**137.0**	**132.1**	
Electrical Machinery	**131.7**	**131.4**	**123.9**	
Fabricated Metal Products	**129.0**	**129.0**	**128.2**	

(*) Estimated (p) preliminary (r) revised

Federal Reserve Board Index for November is 228 (1935-1939 = 100).

This is 6.2% below the spring peak. And by mid-1954 the Index could fall another 4-5%.

• • •

Without too much difficulty, some industries could top their current output sometime during the coming year.

These industries include steel, automobiles, petroleum refining, chemicals, food, textiles, appliances and some non-ferrous metals.

But on the other hand, it is unlikely that tobacco, machine tools, farm machinery, ordnance, railroad equipment and paper will top current levels.

• • •

First quarter 1954 plant and equipment spending is estimated at an annual rate of $28 billion. Last quarter 1953's rate has now been revised upwards to $28.3 billion.

All industries now plan to spend more in last quarter 1953 than they anticipated only three months ago. Lone exception is the mining industry.

Even so, most industries are spending less on new plant and equipment than they did in third quarter 1953.

And they will be spending still less in the first quarter of 1954.

• • •

Manufacturers' new orders for October totaled $1.3 billion — about the same rate as for the preceding month.

Electrical machinery new orders for October added up to $1.3 billion — a $240 million increase over September.

General machinery new orders showed virtually no change from September's $1.7 billion.

• • •

All-industry backlogs at October's end totaled $61.4 billion, or a little over two months' shipments at current rates. This is $13 billion under the October 1952 level.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-25 = 100)*	247.0	244.5	247.9
Steel ingot production (thousand tons)	1,934	1,972	2,207
Electric power output (million Kilowatt hours)	8,582	8,138	8,165
Production of automobiles and trucks	124,659	74,290	129,005
Engineering construction awards (*Eng. News-Record*, millions)	$655.1	$294.4	$241.0

MONTHLY BUSINESS INDICATORS

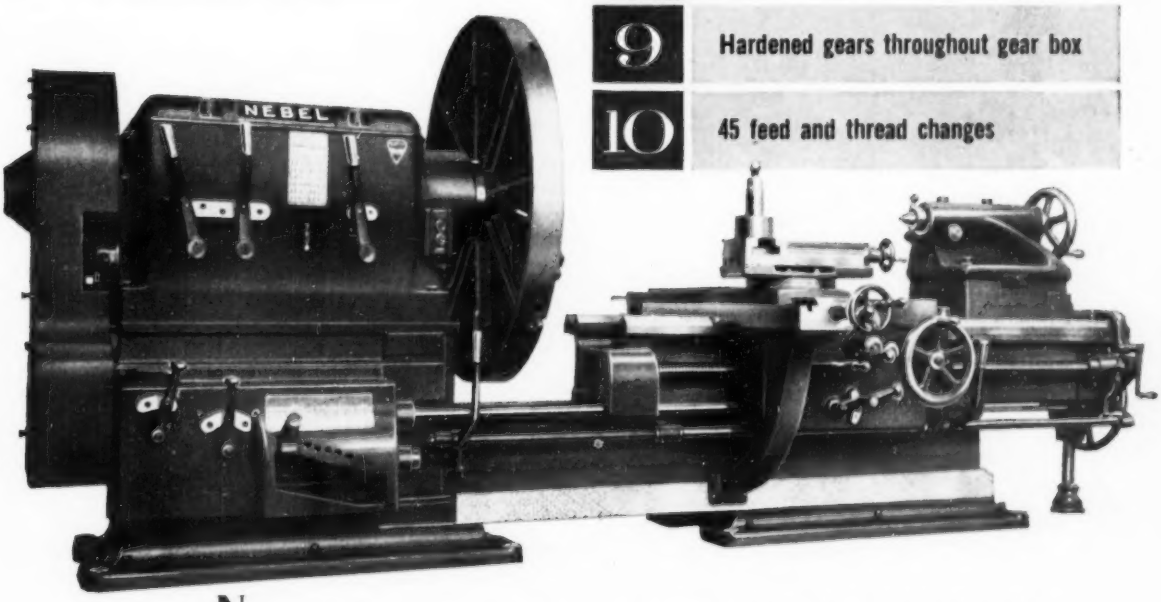
	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	180	231	233
Vacuum cleaners sales (thousands of units)	249	227	292
Washers sales (thousands of units)	311	341	328
Household electric ranges sales (thousands of units)	73	84	66
Radio production (thousands of units)	1,052	1,217	870
Television production (thousands of units)	680	770	724
Gear sales index (1947-49 = 100)	211.1	135.6	160.8
Foundry equipment new orders index (shipments, 1937-1939 = 100)	202.9	317.2	335.8

* Seasonally adjusted

10

big reasons why Nebel is your best buy in gap lathes!

1	Gap open . . . it's a gap lathe!
2	Gap closed . . . it's an engine lathe!
3	Timken equipped headstock
4	Shaved and hardened headstock gears
5	Heavy tailstock easily moved with crank
6	Electric power moves sliding upper bed
7	Hardened gears throughout apron
8	2-station spindle control
9	Hardened gears throughout gear box
10	45 feed and thread changes



Nebel extension bed gap lathes are so useful, accurate, easy to operate and so economical . . . that they have won themselves a prominent place in the metalworking industry. With their flexible swing and center distance capacity they can do the work of two ordinary lathes. Made in two sizes: 20"/40" and 28"/50". Why not send for descriptive bulletins today?

THE NEBEL MACHINE TOOL CO., CINCINNATI 25, OHIO, U.S.A.

Nebel

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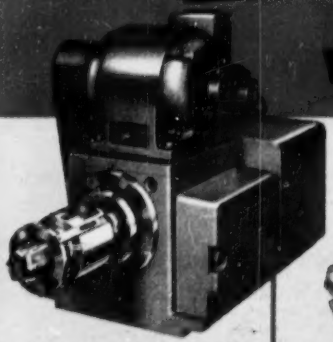
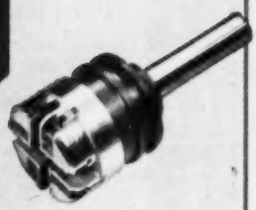
WORKHORSE OF THE METAL WORKING SHOP SINCE 1899

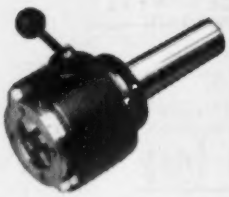
Reduce THREAD COSTS and *Increase* THREAD QUALITY with MURCHEY TOOLS



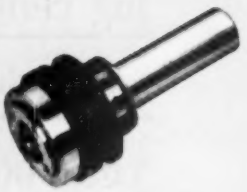
Precision-Pak with die heads and collapsible taps automatically taps holes up to 4" dia., cuts external threads up to 3½" dia.—also bores and reams. Lead accuracy assured by precision lead screw.



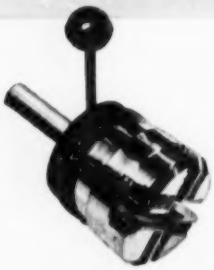
Rotating Die Heads, Type "ORB" with snap action trip and quick change radial type chasers, cut straight threads ⅛" to 5" dia.



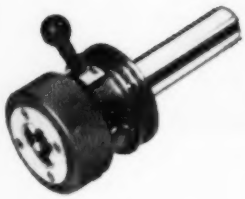
Non-rotating Die Heads, Type "OLB" with pull off snap trip and quick change radial type chasers, cut straight threads ⅛" to 5" dia.



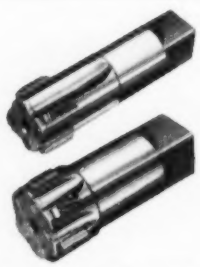
Rotating Die Heads, Type "TRB" with snap action trip and quick change Tangent chasers, cut straight threads ⅝" to 2" dia.



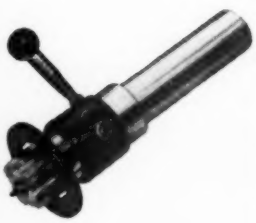
Non-rotating Tangent Die Heads, Type "TLC", with pull-off snap trip and quick change chasers, cut straight threads ⅜" to 2" dia.



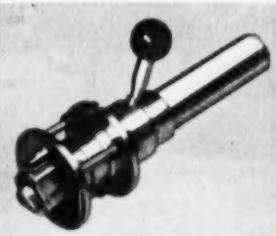
New 4 in 1 Type "ACB" Die Heads, Rotating and Non-Rotating feather action trip, cut straight threads ⅛" to 4" and tapered pipe threads ⅛" to 3½".



Solid Adjustable Taps "EHB" and "RHB" with removable chasers, cut threads 1¼" to 5" dia.—ideal for salvage work.

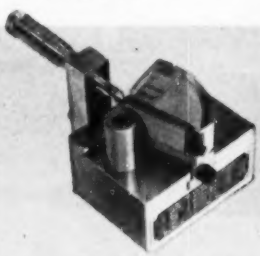


Standard Collapsible Machine Taps, Rotating or Non-Rotating, with easy size adjustment, cut straight threads 1¼" to 7" dia.

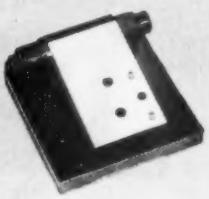


Semi-receding Pipe Taps, Rotating or Non-Rotating, with taper receding action, cut 1" to 6" taper pipe threads. May be arranged for straight threads also.

Type "L" Machine Taps, Rotating or Non-Rotating, with 18 interchangeable nose pieces and 2 bodies, cut a range of straight threads to 6¼" dia.



Tangent Chaser Micrometer Setting Fixture provides longer chaser life and better threads through more accuracy in setting chasers in their holding blocks.



Universal Chaser Grinding Fixture for use on either a surface or cutter grinder assures accuracy in grinding chasers of all types.

For more complete information on Sheffield-Murchey threading tools, get in touch with your local representative or write for Catalog MU-153.

Murchey Division, The Sheffield Corporation
Dayton 1, Ohio, U. S. A.

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

6548

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Machines Do Repetitive Jobs Better

Human beings are the most important factor in any manufacturing plant. You can have up-to-date equipment and a seemingly efficient production setup, but if the morale in your shop is bad, watch out.

One of the places in which discontent can breed and flourish is where repetitive jobs rule. It has been said that this often is the area in which the most friction is generated between men and management.

It is easy to understand why this is so. The deadly monotony of doing a little job over and over again, literally thousands of times, sometimes tends to promote a sense of frustration or some other form of dissatisfaction.

These repetitive operations are the kind that Charlie Chaplin travestied in his famous movie "Modern Times." They are susceptible to devastating criticism by union leaders and sociologists who significantly comment that such operations are on a moronic level and tend to make machines out of men.

Beyond that, this kind of work is subject to recurring charges that management is attempting the speed-up.

Whatever can be done to take the subject of repetitive operations out of the realm of controversy is all to the good. The best way is to remove it altogether.

"One of the challenges of management," James F. Lincoln, president of the Lincoln Electric Co, said recently, "is to see how (repetitive operations) can be eliminated."

The ideal solution is to get these repetitive jobs to the point where they are being done by machines. They thus can be done faster and more accurately by automatic means than by hand.

If and when this happens, the operator becomes the watcher or custodian of the machine rather than the man who does the same little job over and over again day in and day out. He gains stature and responsibility, and is no longer a human substitute for handling equipment.

No one probably would argue that a machine operator, with nothing more to do than press buttons and pull levers, is the most satisfied of men. But his task is far easier and more dignified and less susceptible to controversy than is that of the man who goes through repetitive motions all day long.

Automation has many advantages. And the automatic factory has much to be said for it. It speeds up production beyond human limits without being harmful to man. More to the point, it benefits man because it relieves him of the drudgery and physical effort stemming from repetitive work. At the same time, it increases his output per hour and justifies for him a wage rate that otherwise would not be economically sound.

Burnham Finney

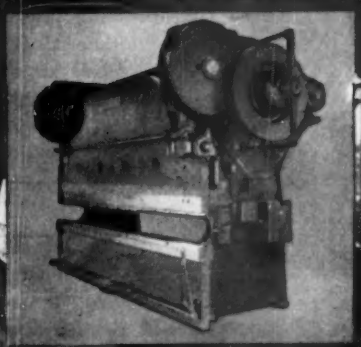
Profitable versatility for jobbing work!

Cincinnati Press Brakes are profitable for bending, punching, press work and a great variety of jobbing applications.

Cincinnati Press Brakes, with low-cost tooling, simplify difficult sheet metal and plate jobs and are versatile, profitable and busy tools in any fabricating shop.

Write for Press Brake Catalog P-4

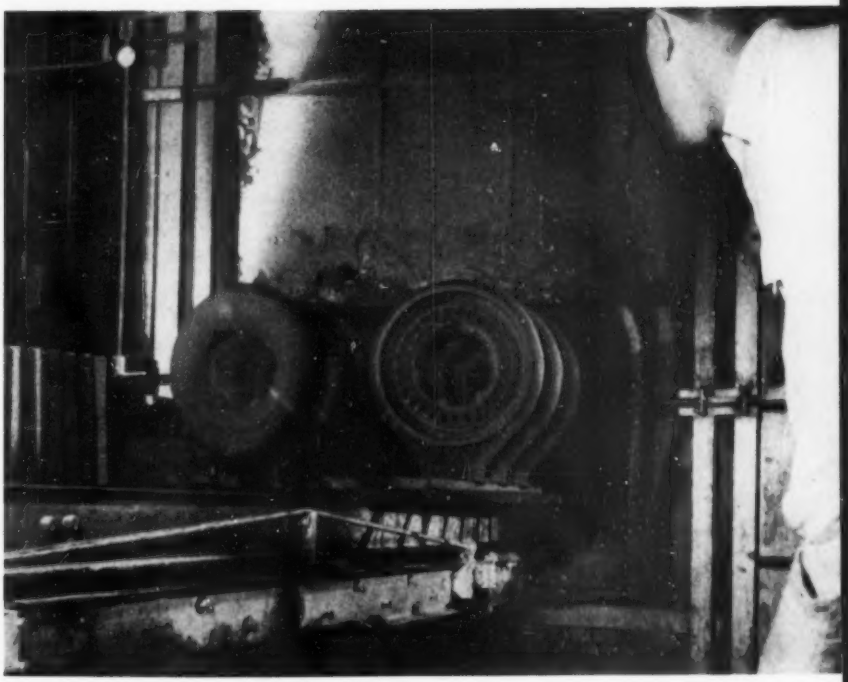
Dished heads, a common problem in the tank field are being formed in a range of sizes with a simple low cost die and without change in set-up.



CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES



ANNEALING IS FIRST STEP in coating process after nozzle boxes have been received from jet-engine manufacturer. The stainless parts are held at 1800F, ± 25F, for 10 to 15 min to relieve stresses and bring out scale on the surface to improve effect of pickling or etching

how to

MAKE STEEL LAST THREE TIMES AS LONG

Ceramic coatings do two things; they help protect against "hot spots" when metals are exposed to high temperatures, and they produce a surface smoothness that has minimum resistance to the flow of hot gases. Applications range from jet engines to furnace muffles; but before application comes fabrication. Here is how coatings are added to a sample part—in this case nozzle boxes for superchargers that go on aircraft engines

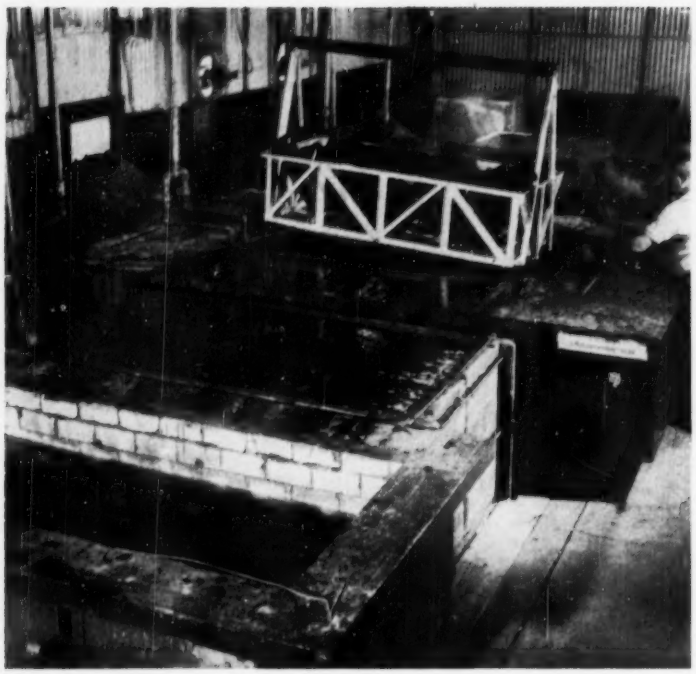
KINDS OF CERAMIC COATINGS

Much development work and standardization of ceramic coatings has been done by the US Bureau of Standards (see Ceramics Shield Stainleess for Jets, AM—July 21 '52, p 99, and Ceramics Make Furnace Fixtures Last Longer, same issue, p 101). As a result, the four-firm industry has a good set of standards that provide a common denominator for any coating applied to any material. Two of the coatings developed by the Bureau are used by Bettinger; A-418 and A-19, the latter for mild steel. Bettinger also uses Solar 5210-2C for 18-8 stainless, and about 20 modifications of these coatings. A dozen other special coatings are designed specifically for specialized metals, such as Inconel, Haynes L-605, and the like.

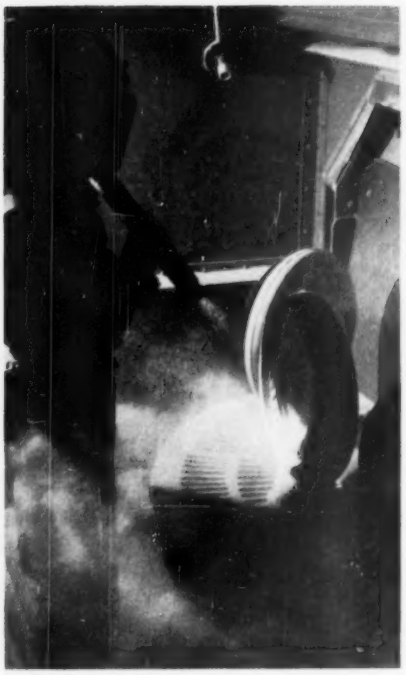
By FRED B SHAW, VP and Gen Mgr, THE BETTINGER CORP

Coating ceramic materials onto metal parts is something like coating metal building panels, which Bettinger also handles on a production basis. However, the differences are important. For one, the ceramic for high-temperature use must be treated most carefully, which means careful handling and close control on production processes.

A number of special materials-handling devices have been worked out, including special racks to carry



ACID TREATMENT IS NEXT. It removes scale and etches surfaces completely clean. Box around acid tank is part of exhaust system, which is most important because solution of nitric and hydrofluoric acids is maintained at 200F.



SANDBLASTING TAKES OFF ANY SCALE left by acid; also etches surfaces so they will take coating better. No. 45-mesh flint shot is forced through hose at 40 psi, which is not high enough to warp or distort the parts

coated—but not fired—parts to prevent damage to the coatings. Only one reworking is allowed on most parts, and parts are often expensive units to start with. Thus, extra precautions must be taken.

Cleaning processes involve hydrochloric acid, hot water, compound acid, another hot rinse, neutralizer, and dryer; through all of which the parts are moved on a production-line basis. Sand-blasting is also carried on after all threaded or otherwise-machined surfaces have been masked. Tests of results have proven that silica, grit, and shot are not as effective blasting materials as flint; and also that no matter how careful the sandblasting, a full acid-etch treatment cannot be bypassed.

The ceramic slip, which is milled and mixed under close quality control, can be applied by dipping, slushing, or spraying, depending on which kind of application works best for the surfaces of each part. Low-pressure and special nozzles allow even spraying on parts of odd shape. Dipping is the fastest and least expensive coating process, and is applied whenever possible. Drying time is an important factor in quality control, and is gaged with a special arrangement of dryer.

After firing, inspection makes use of a number of devices for seeing out-of-sight spots inside the parts; some are mirrors, which allow detection of spalling and missed coverages. These defects can be reworked once, but no more.

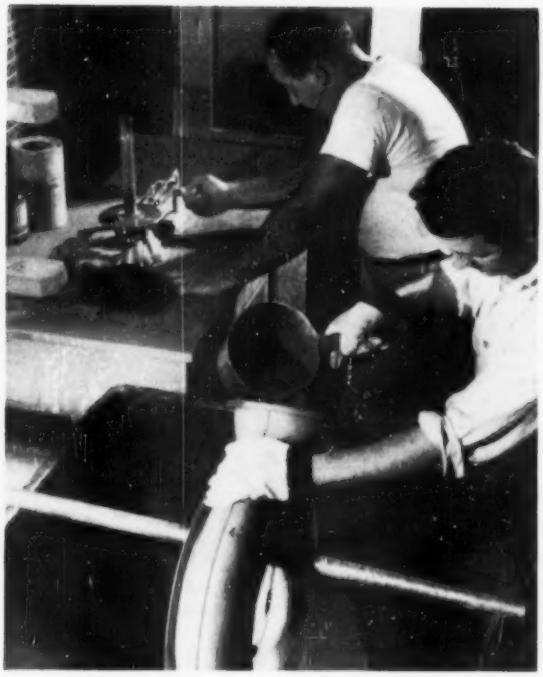
HOW COATINGS WORK

Ceramic coatings were originally developed for two purposes; to protect metals at higher operating temperatures than they could normally stand without rapid oxidation or corrosion, and to allow use of thinner stock (to save critical metals) by providing extra protection at elevated temperatures. But later applications have proven out other advantages, such as cost savings because maintenance is reduced and metal life extended. Another value of coatings is that they allow substitution of materials in a given application, such as mild steel instead of special stainless.

A fair representation of the parts coated by Bettinger is probably characteristic of how far this field has spread to date:

- Nozzle boxes for internal-combustion aircraft engines
- Exhaust parts for the same engines
- Combustion-chamber parts for jet engines
- Tubing for oil-processing plants
- Trays and mufflers for industrial furnaces
- Collector rings
- Flame holders

Obviously, ceramic coatings fill a critical need in the field of high temperatures, for they are effec-



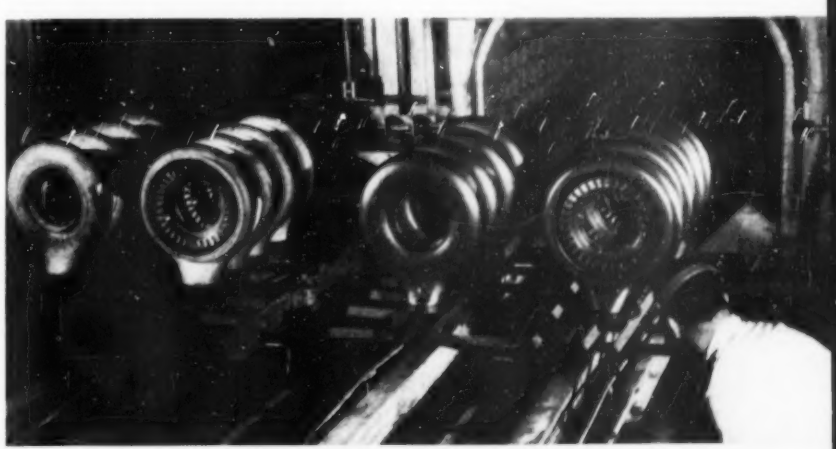
COATING IS PREPARED in small batches, each lasting about a week, to prevent breakdown in storage. Test nozzle box is slushed before lot is started to check results. Liquid coating is constantly checked for gravity, pickup, water content, and temperature

SPRAYING COVERS OUTSIDE SURFACES of nozzle box. Expert operators are required for this work because coat thickness must be held at from 0.001 to 0.0015 in.; less than this doesn't give 100% protection, more tends to allow spalling during thermal-shock tests

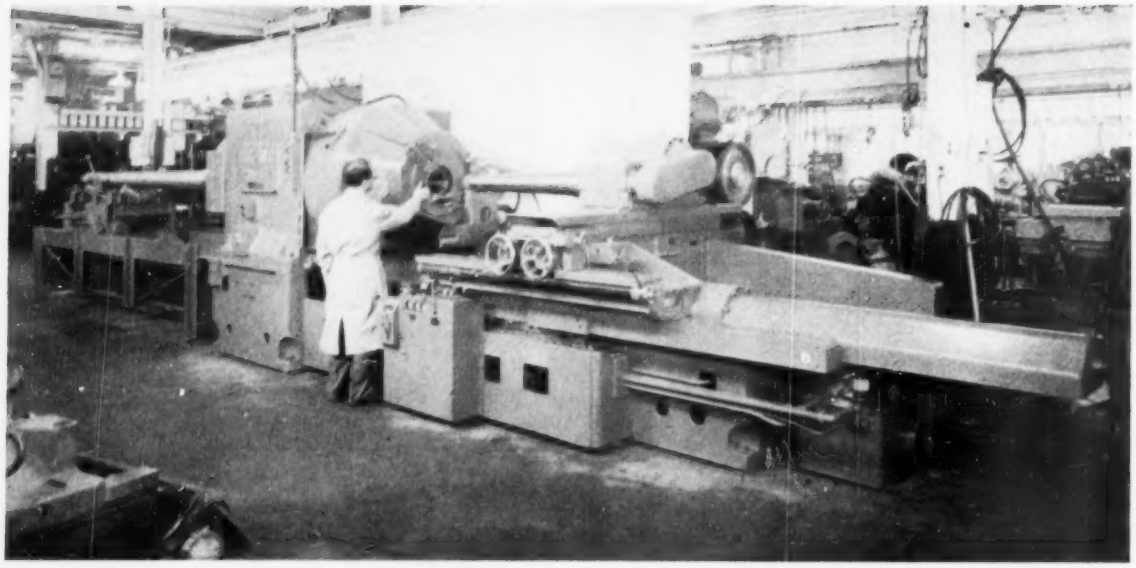
tive in applications where temperatures range up to 2100F (or less depending on the particular coating under consideration). Above 1500 F, life extention is roughly two to three times normal life. They also fill a need in lower temperature ranges, for at under 1500 F, coatings tend to prolong corrosion-free life of the metal almost indefinitely.

As to costs, a coating is less expensive than titanium, and provides three other advantages; the coating will take temperatures higher than those at which titanium will break down, it is more easily machinable, and it leaves the original properties of the base metal, which in some cases are more desirable than those of titanium.

SLUSHING IS METHOD OF COATING INSIDE SURFACES. Liquid is poured in thin stream from hose, allowing gravity to spread it. Considerable operator skill is also required here, for parts must be tipped and tilted to obtain good flow and even coverage



FIRING IS FINAL OPERATION, done in muffled box furnace at 1875F for 35 min. Furnace is oil-fired and closely controlled to prevent spalling or jumping of ceramic coat before it is completely solidified



INTERNAL GRINDER, Model 2440-RY, developed for powder chambers of 120- and 155-mm gun tubes, has dual-traverse feedscrews controlled by bell cranks from contour plates to provide control for tapers

CUT FINISHING TIME 2/3 ON 120-MM

Tracer-controlled grinders have been taking over the internal finishing of gun-tube powder chambers a size at a time. With a new method of control, the latest machine handles the 120-mm, will soon be grinding the 155-mm

GRINDING the tapered internal surfaces of powder chambers in gun tubes has been studied by the manufacturing division at Watervliet Arsenal for many years. The early work with the 37-mm started in 1937 with the first grinders purchased in 1939. These were followed shortly by machines for the 75- and 90-mm tubes.

These grinders all operate on a lever principle with 2:1 reduction. They replaced the former method of reaming and hand polishing.

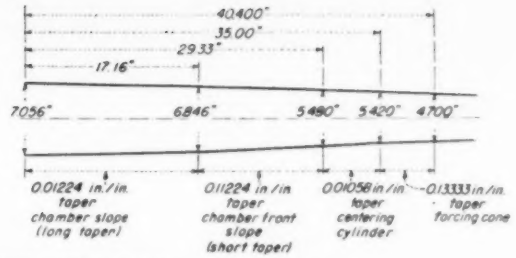
Work on a method for grinding the 120- and 155-mm tubes began in September, 1950. The machines for this operation, as for the others, were developed by Bryant Chucking Grinder Co for Watervliet Arsenal and built by Bryant.

The powder chamber of the 120-mm is more than 40 in. long, making it necessary to develop a machine along different lines from those for the smaller tubes. To reduce the size of the mechanism, a 1:1 ratio was adopted. Two contour plates are provided, each controlling half the length of the powder chamber. One plate controls form dressing and grinding of the contours at the breech end of the chamber. A new wheel is mounted on the spindle and the other plate controls the dressing and grinding for the deep end.

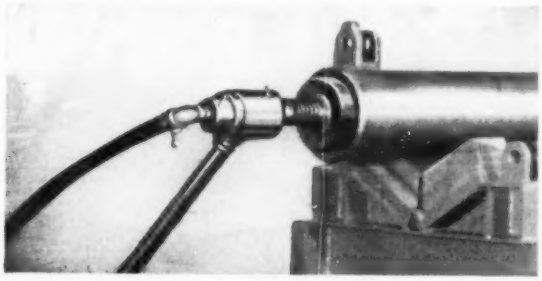
These contour plates are mounted under the table at the right front of the machine. Dual cross-feed units are required, one to operate from each contour plate. Each feed unit consists of a handwheel geared to a feedscrew. There is a feedscrew nut on the end of the feedscrew. Rotating the screw with the handwheel will advance the nut but not the feedscrew itself.

Each feed nut contacts a button on the underside of the table and will advance the table against hydraulic pressure. One revolution of the handwheel produces 0.025 in. crossfeed with a fine feed knob graduated to 0.0005 in. (0.001 in. of a hole diameter).

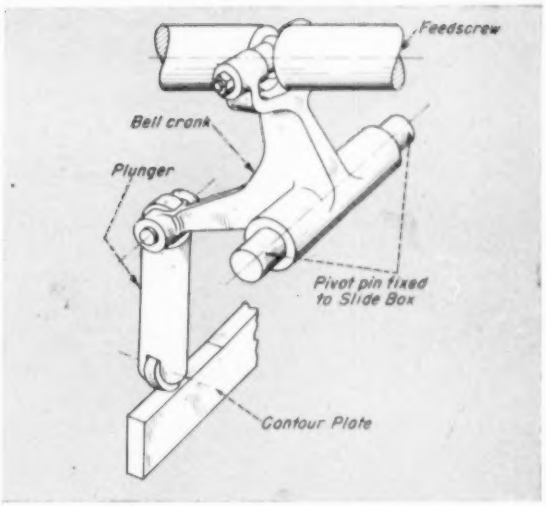
In contour grinding, a roll mounted in a plunger travels on one of the contour plates. A bell crank, operated by the plunger, changes the vertical motion of the roll to horizontal motion of the feedscrew and feed nut. A second roll and bell crank operate from the other contour plate on the second feedscrew. The feedscrew nut



FOUR TAPERED SECTIONS are ground in the powder chamber of the 120-mm gun



COOLANT at a rate of 8 gpm is applied from muzzle end of tube through a plug with swivel mount for supply tube



BELL CRANK transmits motion of roll on contour plate to feedscrew. This produces axial movement of feedscrew and feed nut. Handwheel rotates the feedscrew for setup, changing position of feed nut but not disturbing position of bell crank or feedscrew

POWDER CHAMBERS

By ANDERSON ASHBURN,
ASSOCIATE EDITOR

that is not in use is retracted by the handwheel.

Because of the 1:1 reduction, dirt or defects on the contour plates will produce variations of equal size in the powder chamber. It is essential, therefore, to handle the plates with care and keep them clean. Guards protect the plates when in place on the machine. Contour plates, mounted on T-nuts, can be changed for different designs or sizes of powder chambers within limits of the machine.

Each 120-mm gun tube represents an investment of about $5500 at the time the powder chamber is ground, hence it is important to have a machine that will not grind oversize on any of the four tapers in the powder chamber, or otherwise shift the grinding wheel against the breech or bore and ruin a tube.

The wheelhead is supported on a preloaded roller-bearing cross slide. During grinding this slide is held in contact with one of the feedscrew nuts by a hydraulic cylinder. When the wheelslide is in the extreme right position, this cylinder will move the cross slide to the rear for access to the work. Interlocks prevent advancing the wheelslide toward the work while in this position.

The gun tube is located in the machine by a spotting ring on the outside of the tube just ahead of the forward chucking position and from the bore just ahead of the powder chamber. The spotting ring is turned in a lathe with the gun tube held between center plugs. The bore position is determined by a telltale bar with indicator.

This locating arrangement has proven to be superior to locating from the ends of the bore because of difficulty in eliminating sag in the tube while locating which would result in grinding the powder chamber out of line with the adjacent bore.

A 5x2½x2½-in. grinding wheel, Type 97A46TV36, mounted on the spindle, can be used down to 4½-in. dia on the rear taper and down to 4¼-in. dia on the forcing cone.

A hydraulically operated diamond dresser is mounted on the bed adjacent to the front of the work. This dresser pivots up out of the way when not in use.

In operation, the wheelhead is operated at 5200 sfpm and traversed at 30 ipm. The operator feels his way into the bore, checking for high spots and removing them before making a complete traverse stroke. The finish obtained averages 32 mu in. rms.

The powder chamber is reamed prior to grinding, leaving 0.015 in. to be removed by grinding. At present the floor-to-floor time averages 7.5 hr per tube. At Watervliet the feeling is that this will be cut materially as the operators become more familiar with the machine. This time compares with about 24 hr for the reaming and hand polishing that the grinder replaces.

THIS IS THE LAYOUT; it's wide and ready for eventual expansion if required. Three buildings are now producing —the fourth is a warehouse. Buildings can be extended off to right, and spaces between them can be roofed over

APPLIANCE PARK:

100 acres of mechanization

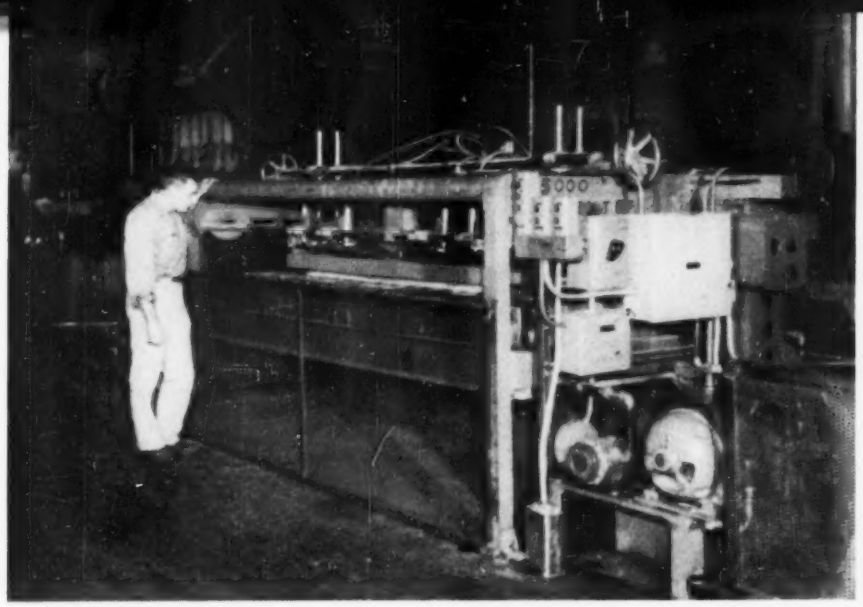
BY BEN C BROSHEER, ASSOCIATE EDITOR

When General Electric decided to consolidate all engineering, production, and marketing for its "white-goods" line (ranges, refrigerators, washers, etc) at one huge plant near Louisville, Ky, it gave production engineers the opportunity to build a materials-handling system from the ground up. Two purposes are met by the new project: (1) Each department is fully integrated to turn out one product under a single general manager. (2) All equipment is of general-purpose design to allow easy changeover to a new model or different product by switching the tooling.

Appliance Park is GE's biggest construction project to date, and will consist of five manufacturing buildings, three of which are operating now. About 12,000 employees will eventually be working there; only 4200 are now employed. Products now being turned out are automatic clothes washers and dryers, ranges, dishwashers, and food-waste disposers. The target production rate is a capacity of a major appliance every 3½ seconds.

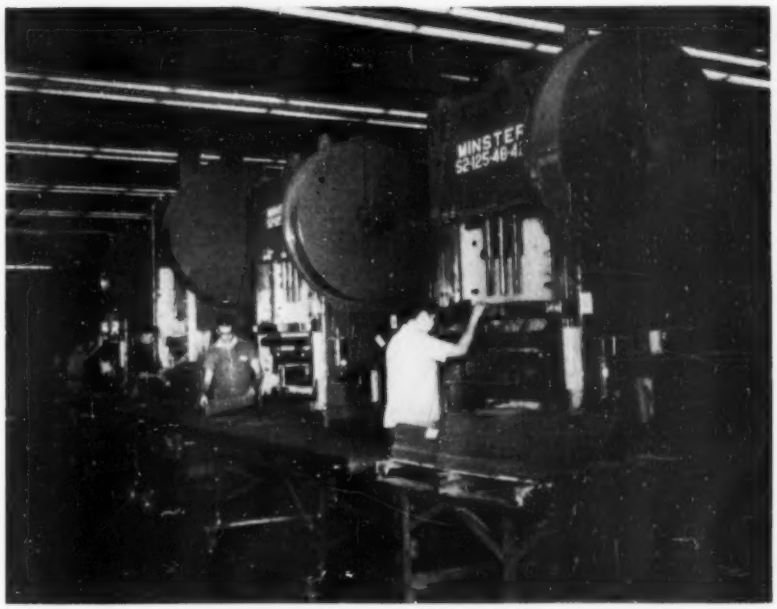
The plant will contain 42 miles of conveyors, and will load or empty 300 railroad cars and 200 highway trucks per 24-hr day.

Because of the demand for versatility, the plant is not automatized, but contains an engineered mixture of automatic and manual operations, most unusual ones shown on the following pages.

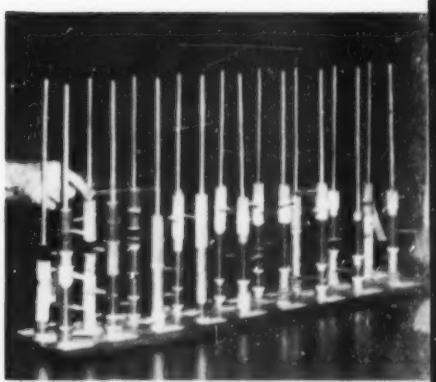


PRESS SHOP IS FED SHEET STEEL from Dexter unit. Stock for range bodies moves from feeder along roller-conveyor system fitted with limit switches that control flow. In background are three press lines and a resistance-welder line

MINSTER PRESSES IN RANGE AND WATER-HEATER DEPARTMENT are served by powered Rapistan belt conveyors that can be set up and shifted around as required by flow from press to press. Blanking and forming presses are located on edges of press area to simplify scrap disposal

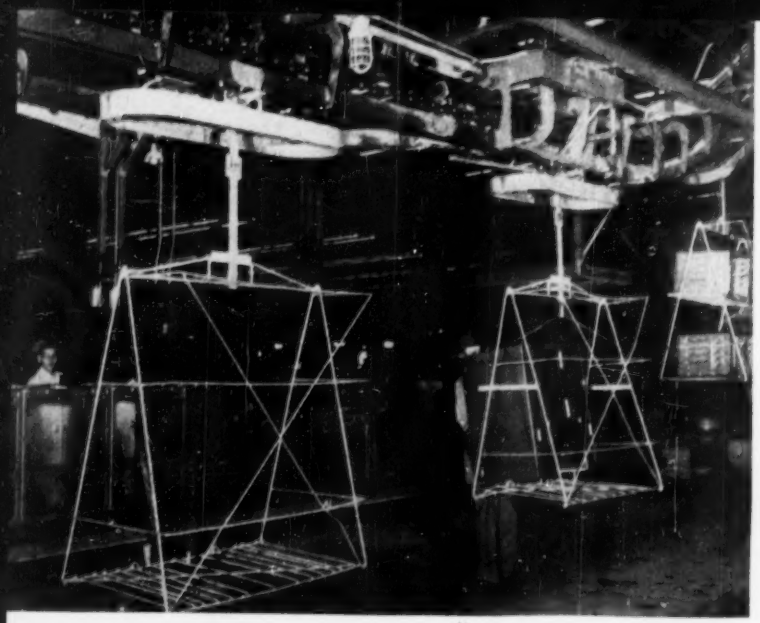


SCRAP IS CHUTED FROM PRESSES directly to 375-ft May-Fran conveyor in basement. Cutouts drop straight down from presses into trucks that are dumped into same conveyor at loading point farther along. Heavy steel-beam floor construction above conveyor is to allow press relocation when layout is changed

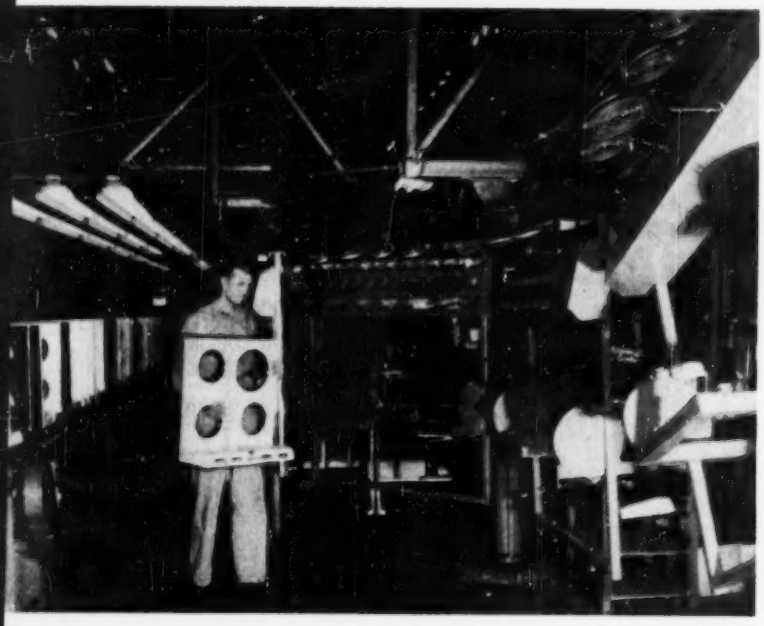


PRESS-LOAD PEGBOARD REDUCES PLANNING TIME by showing each hour of press time as a colored washer. This is schedule board for home-laundry-equipment press department

cooking ranges



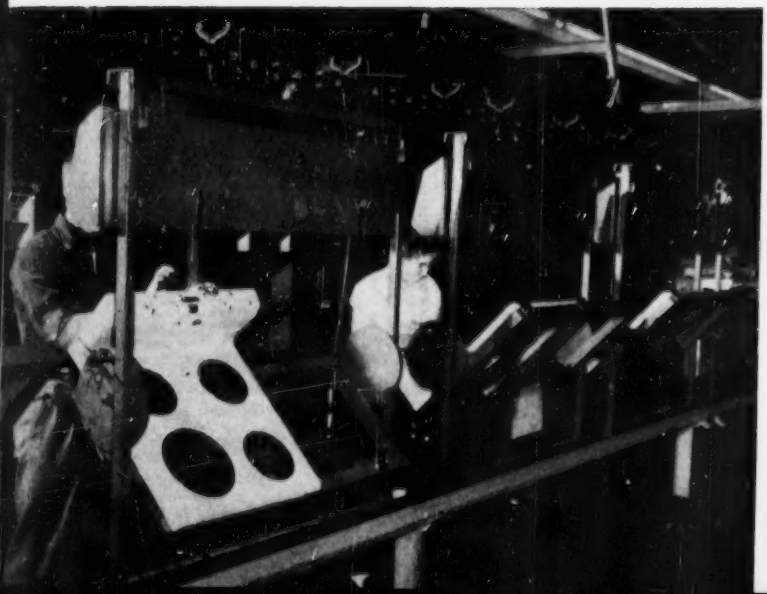
WEBB POWER-AND-FREE MONORAIL CONVEYOR carries range and water-heater parts from four of these loading stations to the pickling department where nickel sulfate is sprayed on before vitreous enamel is applied. Two conveyors feed through the enameling line

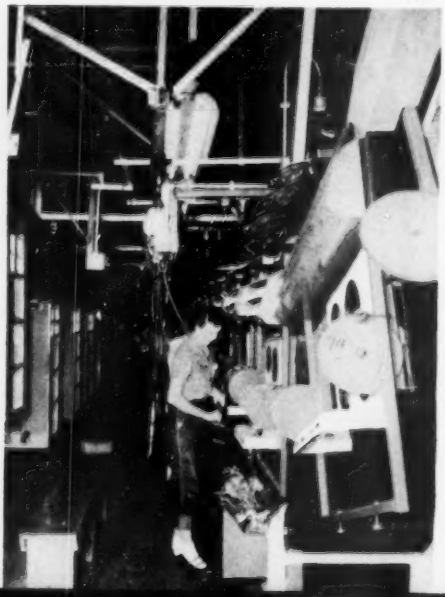


ENAMELED RANGE TOPS are inspected on belt conveyor at left; transferred by hand to monorail conveyor at right. Conveyor carriers have tiltable fixtures that ease later assembly work. Small parts on conveyor were added in stock room, through which conveyor passes, too

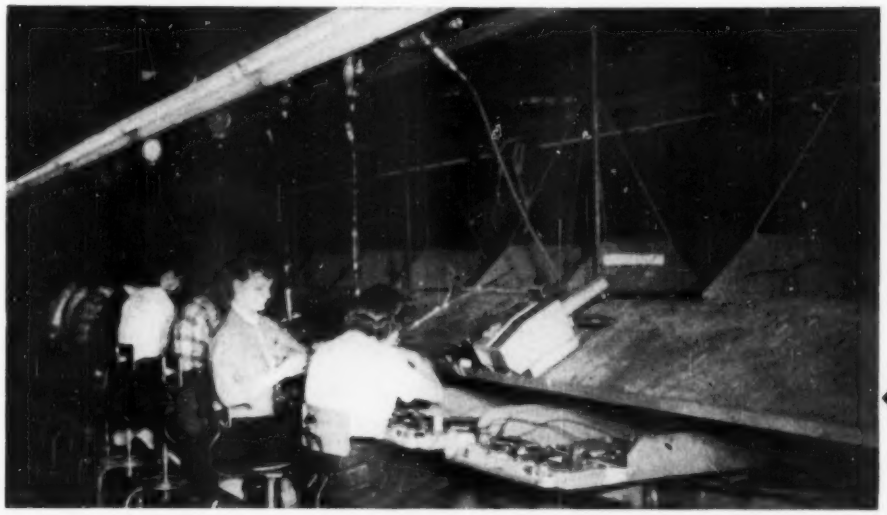
(Below and left.)
FINAL ASSEMBLY OF RANGE TOPS requires tilting fixtures, of which there are 186 on this line. There are 30 stations for assembly and test. Conveyor speed can be set at from 5 to 50 fpm

ASSEMBLY AREA IS SERVED by conveyor with shelved carriers that hold small parts (left) and main conveyor (right) that moves tiltable fixtures with major range parts along at a constant rate of speed. Parts conveyor moves twice as fast as main conveyor

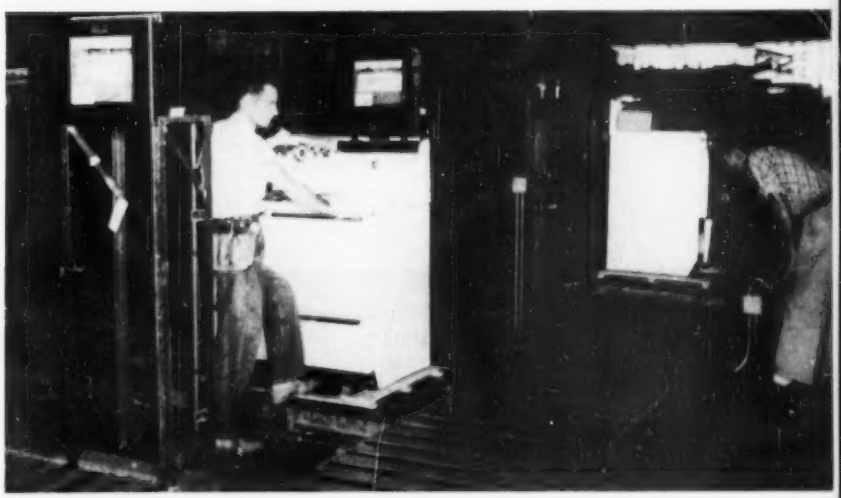




go together like autos...



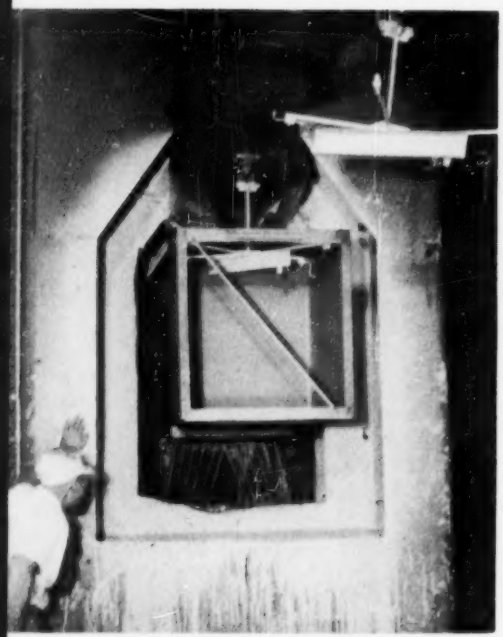
SUBASSEMBLIES ARE PUT TOGETHER on carrousel conveyors. This one has fixtures that hold range switches and other parts while wiring harnesses are made up



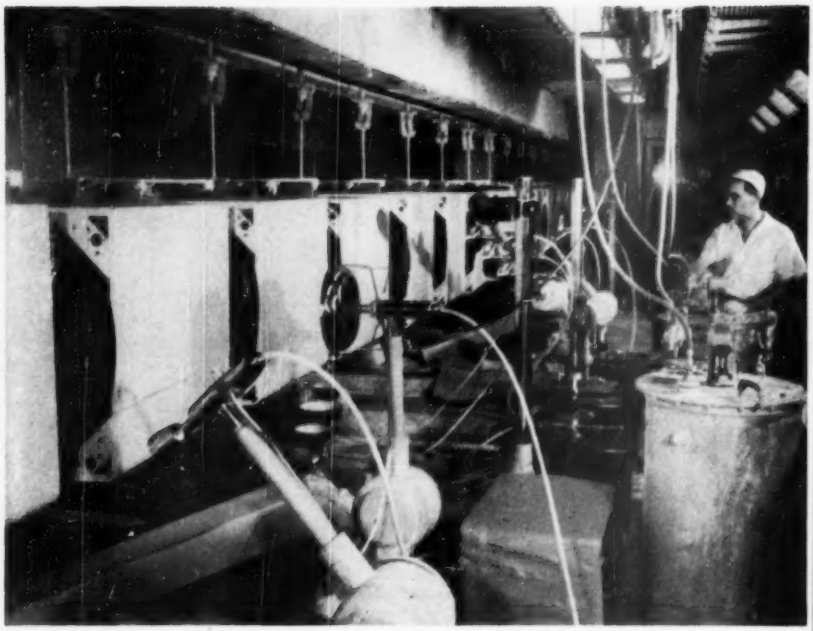
WOOD-SLAT CONVEYOR 285 ft long moves ranges through final assembly to final test station where 25 ranges are removed from line per day for a quality-control inspection. Elevator simplifies pickup and removal of test range. Same station can remove ranges that require extra adjustment

disposal gets a ride...

DISPOSAL UNITS ARE CARRIED on unusual power-and-free monorail conveyor during assembly. Carrier fixture arm can be moved to suit the operation and locked in place

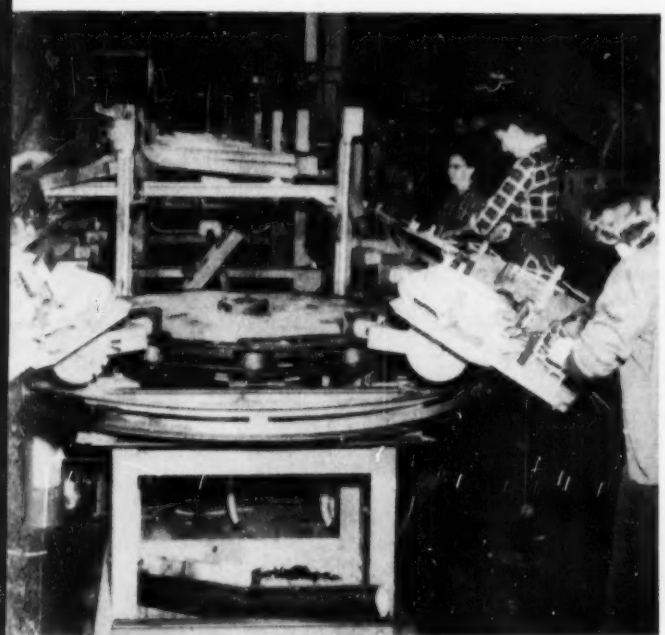


FLOW-COATER PAINTS SHEET-METAL PARTS for automatic clothes washers and dryers. Conveyor here is a standard overhead monorail with hangers. Operations leading up to flow-coating are washing, phosphate-coating, and drying. Paint coat is oven-baked

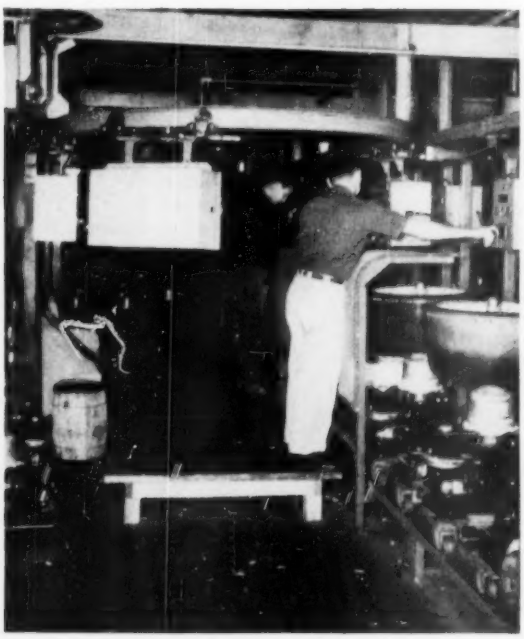


FINAL PAINTING IS DONE with Ransburg No. 2 electrostatic spray system installed in conveyorized booth. Two overhead conveyor chains provide proper spacing and transfer rate for different parts

washer line flows along

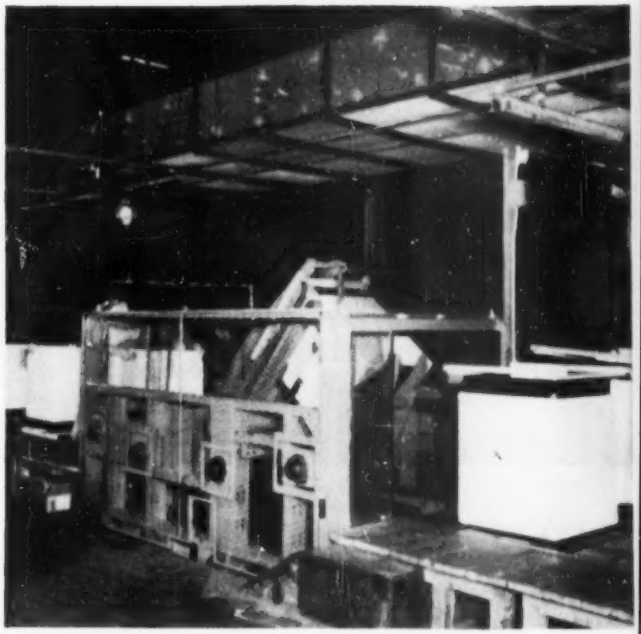


PEG-BOARD FIXTURES on a carrousel conveyor hold parts while harnesses are assembled for washer and dryers. Quick-acting clamps hold the fixtures, allowing easy interchange when different models are to be run. Carriers can be tilted 90°



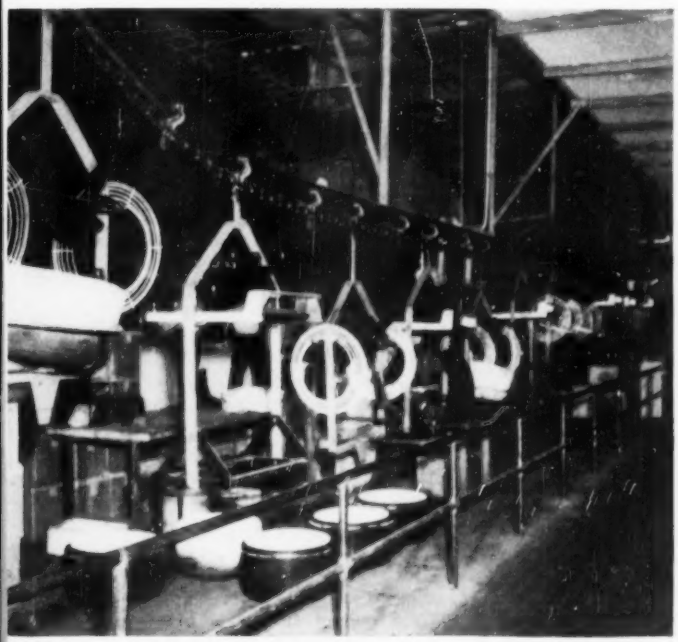
TRAVELLING METER BOARDS suspended from overhead monorail move parallel over roller-skate conveyor that moves clothes-washer drive units along. This follows ½-hr run-in; and allows complete electrical test of drives before assembly into housings

PALLET CONVEYOR carries inverted automatic clothes washers on pads, with washers on 63-in. centers. Power units are inserted and assembled with power tools on counterbalanced reels

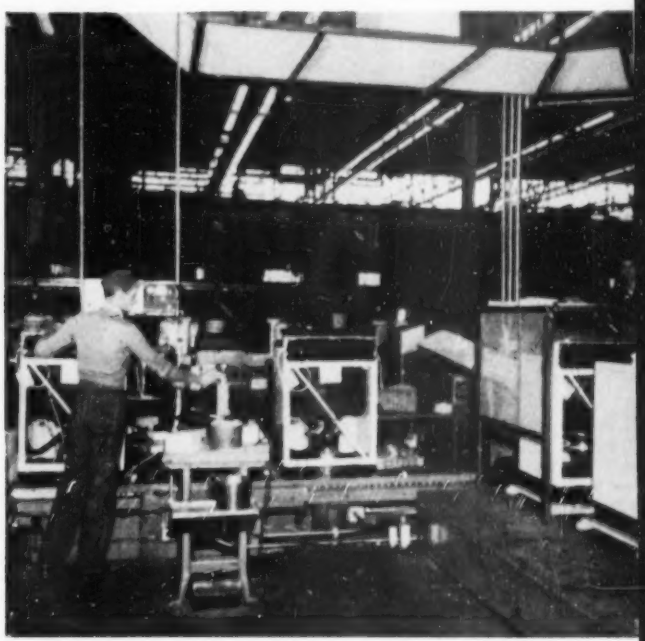


AUTOMATIC TURNOVER UNIT upends washer cabinets as it transfers them from 50-ft primary-assembly conveyor to 150-ft final-assembly conveyor at left. Centerdistance between washers on conveyors is important because turnover is timed to the spacing

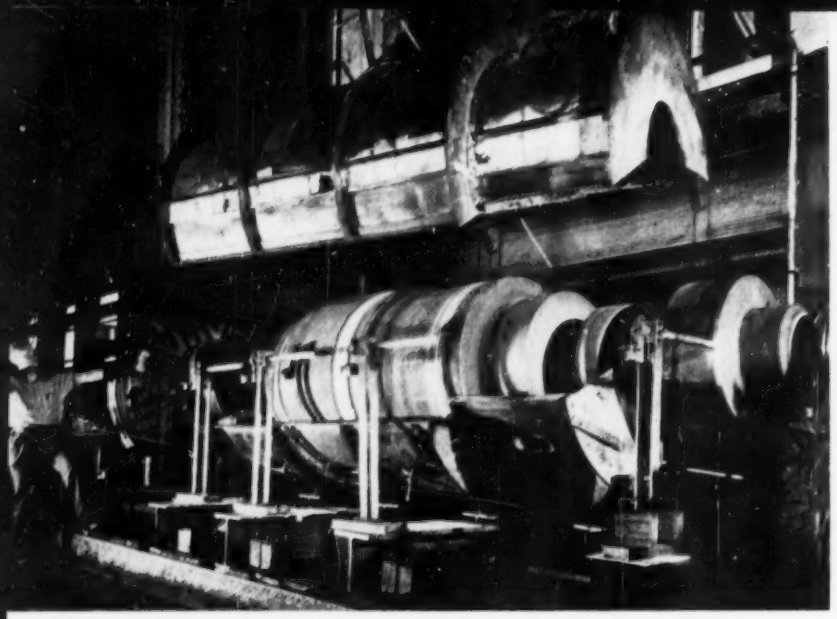
without hitches...



OVERHEAD MONORAIL BRINGS IN PARTS (tubs, activators, retainer rings) on specially designed carriers into final-assembly area next to 150-ft pallet conveyor

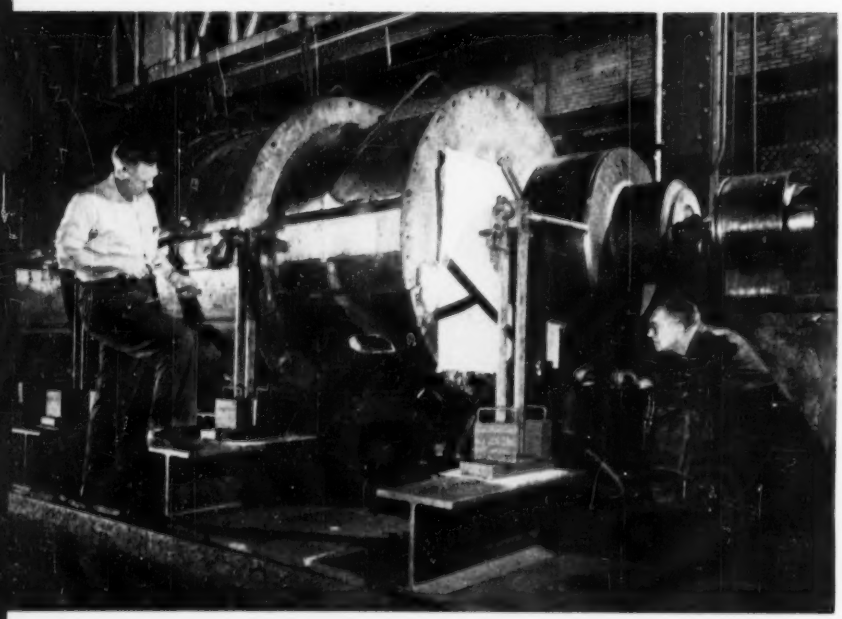


ASSEMBLY LINE HAS NO DELAYS because two inspection stations can transfer defective units to branch lines for touchup or adjustment. Pushbutton moves one unit out of the line while a corrected unit is brought back into the line after reworking. Similar check station operates for regular inspection of every tenth unit on the line



GAS-FIRED FURNACE is built in two sections using a sandwich of two steel sheets, filled with asbestos, as the wall. Unit is mounted on wide-flange beams laid across the lathe ways, which also serve as stable bases for indictor stands. Gas burners are introduced through holes in lower section of shell; thermocouples are mounted in upper section. Special tailstock allows for changes in length resulting from expansion or contraction. Heating and cooling cycle takes 24 hr or more

furnace on a lathe...



FORGING IS INDICATED at 5 diameters along its axis as it is heated and cooled. Indicators are mounted on stands which also provide extensions to reach through furnace walls. Rotor must be true within 0.001 in. between hot indication and indication cold. Distortion caused by internal stresses, resulting from the heat, is not permissible in turbine rotors. Without this test, the superheated steam used to drive the turbine could release these stresses and distort the rotor to the point of jamming or excessive wear

...permits indicating at 1000 F

BY WM M STOCKER, JR.
ASSOCIATE EDITOR

Turbine rotor forgings such as these, manufactured by Bethlehem Steel Company, Bethlehem, Penna, must be of extremely stable composition. In spite of their size, these steel rotors operate at high speeds and high temperatures, yet the clearance between a rotor and its stator is extremely small. In operation, even a small distortion could be disastrous. Hence every rotor forging is indicated at various locations and through a temperature cycle from room temperature to 1000 F and back to room temperature. Total permissible variation in runout is determined at 1000 F and after cooling

Where are machine tools going in design?

Trends, foreign and domestic, in machine-tool design here are evaluated by the past-president, NMTBA, and president, ASME, himself a machine-tool builder. His points are worth study

BY FREDERICK S BLACKALL, JR

President & Treasurer, THE TAFT-PEIRCE MFG CO, Woonsocket, R I
President, AMERICAN SOCIETY OF MECHANICAL ENGINEERS

We are approaching a fork in the road at which machine-tool designers must give consideration to two radically different classes of machine tools. One fork will lead to a further and intensive development of the present trend towards automatic operation, maximum utilization of horsepower, the ultimate in feeds and speeds, and all of the other features which contribute to the highest possible productivity in mass production. This seems to be the present objective of all machine tools, with the exception of those designed primarily for toolroom work. Important though it be for us to pursue this objective vigorously, if we are to hold our own in world competition against producers whose labor rates are a quarter to a third of ours, this objective falls far short of meeting the needs of a very substantial portion of industry.

The influence of the automotive industry on machine-tool design has been great and constructive, but in catering to this important customer, many machine-tool builders have gone off the deep end in emphasizing massiveness, a multiplicity of controls, and a degree of automaticity which is practicable only in the mass-production industries. The automobile builder has demanded these changes, and with every right, for his particular purposes. The error has been in the assumption that what is necessary to automotive production will probably be suitable for everybody else. This is far from the case. I believe that a tremendous field is open to the machine-tool builder who will simplify the design of some of the basic machine tools for general-purpose use.

GENERAL-PURPOSE MACHINE

Never forget that there are a great many operations, even within the mass-production industries, which can be performed just as rapidly on a general-purpose machine tool as they can on one of the more complex models. In such cases, many of the more expensive features simply are not used, but they have to be paid for, nevertheless. Many of the "new-era" machine tools have more handles and pushbuttons on them than a calculating machine. Some of this complexity is never needed by the average user, and much of it is needed only in special cases by any user.

Though it may be heresy to say so, I believe that in many cases we have gone so far in the direction of weight and heft, automaticity, pushbutton controls, and a host of other costly features, that many machine tools are getting to be just too expensive. It grows increasingly difficult for the average concern to keep its plant up-to-date with the proceeds of its depreciation allowances, even if supplemented by a substantial appropriation from annual earnings. There is a crying need for an attack on this problem, and I believe that one good way to attack it would be to make available an effective range of machine tools of adequate, yet more simple, design, for the performance of much of the ordinary production of industry—especially small-lot production, which, in the aggregate, plays a tremendously vital part in our economy.

You may counter that there are already plenty of general-purpose machines on the market. There are indeed some, but most are what you might call poor relations—secondary lines—and not at all the type which I have in mind. Consider lathes: The general-purpose engine or turret lathe should be built to the same degree of precision as the most advanced high-production unit. It should be capable of high-speed turning with carbide tools. It should possess a considerable degree of flexibility in the choice of feeds and speeds. Ability to produce a fine finish should be emphasized.

Similar characteristics should be embodied in the general-purpose milling machine—a reasonable selection of table feeds from the conventional to the highest, provision for modern milling techniques, including climb milling, provision for flywheel cutters, and in some models, perhaps modest application of automatic features, such as quick return of the table at the end of the cut. The utmost attention should be given to skillful design of bases, head and tailstocks, tables, columns, and other heavy components, to provide minimum weight consistent with requisite rigidity. The latter should be accomplished through sound design rather than sheer dead weight. Weldments, high-physical-property irons, aluminum, magnesium, and plastics should be given increased consideration. Ability to turn out precise work and maintain accuracy is of primary importance, however. This is a challenge to the engineer.

MODERATE PRICE

In producing such machines, the most modern and efficient production techniques should be followed to permit them to be priced as moderately as possible. Standardization of parts and the maximum possible interchange of parts within a given line of machines should be sought to minimize costs. Components should be well tooled up and efficiently gaged, to the end that machines will virtually fall together in assembly, with minimum cutting and fitting. Here a lot of time can be saved in manufacture. In brief, every possible step should be taken to produce such machines at really low cost.

I believe that the machine-tool builder who will approach the problem from this angle will be amazed at the volume of business which he can develop. Indeed, volume should be much more readily attainable on equipment of this nature than on mass-production equipment where the special requirements of each large buyer have to be given their sway.

Abstracted from "New Trends in Machine Tool Design—Foreign and Domestic," before Cincinnati Section, ASME, on Nov 5

If you doubt the market for the soundly designed general-purpose machine of moderate price, take a look at what one New England concern has done during the past decade in the field of light but effective small milling machines. With foresight and intelligence, it bucked the trend towards bigger, more-complex, more-expensive machine tools and brought out a small machine which sells at a fraction of its nearest equivalent in the traditional standard milling-machine lines. The trade was suspicious at first and thought this was just another second-rate milling machine, but you will see them today in top-notch plants all over the country. For some reason which is hard to fathom, they have no real competitors. This is the kind of a job which I think ought to be done throughout the whole range of basic machine tools.

FOREIGN-TRADE POLICY CHANGING

It is high time we faced the little-realized fact that the whole character of our foreign-trade policy has changed enormously during the past two decades and that, relatively, we are now a low-tariff, not a high-tariff, country. Thus American manufacturers must get their houses in order and provide themselves with equipment which will minimize the inordinate disadvantage from which we suffer relative to Europe in our cost of labor, for we are going to have to meet competition from overseas of a sort which we have never faced before.

As the volume competition will be borne by the mass-production industries, American machine-tool builders must take care to maintain the lead which they now enjoy in the special field of tools for production. This is vital, and it must not be assumed that my parallel interest in the development of general-purpose machine tools implies any lack of appreciation of the tremendous importance of this market. What, then, are the trends to which the designer should be alert in planning the mass-production tools of tomorrow?

Of course, the big word at the moment is "automation," unquestionably an important trend in production tools. The high cost of labor will stimulate the effort to reduce the human element at every possible point, to make the machine pace the operator, rather than vice versa, and to minimize operator fatigue. These objectives will be served by continued emphasis on automatic features, design which will simplify the maintenance problem of the large plant, and sturdy construction which will permit the use of carbide tools at their maximum capacity at all times.

Every possible step should be taken to assure machine operation at optimum speeds and feeds. Incidentally, machine designers would do well to give increasing attention to higher speeds and feeds not only in turning and boring operations, but on millers, planers, shapers, and the like. In many cases, we have not yet begun to approach the full potential of cutting tools made from modern super-hard cutting materials.

However, optimum speeds and feeds are not the sole answer to cost reduction. A careful operations analysis will usually indicate that actual machining time is a surprisingly low proportion of the total production time. Setup, loading and unloading, gaging and checking take a heavy toll in costs. Thus there will be a growing emphasis on cutting the time involved in performing nonproductive elements of the work and in reducing machine downtime. Automatic loading will come in for its share of attention, as well as ease of chip removal. The latter need not necessarily imply conveyor mechanisms, but in some cases may involve departure from traditional construction. Such a trend is evident in the Fischer lathe and machines of similar design, in which the ways are disposed at an angle approaching the vertical plane, permitting the chips literally to fall out of the machine instead of into the bed. The engineer of tomorrow will not be inhibited by tenets of traditional design. Automatic gaging features will come into increased use, both on the machine tool and in the form of separate gaging machines. The air gage, the electrical gage, and electronic devices are particularly suitable for working into machine-tool construction, and in many cases will effect substantial cost savings.

Similar considerations will affect the design, for all classes of machine tools, of special tools and other aids to manufacture, setup and pre-selective positioning devices, etc. Incidentally, the latter, both as built-in features and as accessories, are converting the horizontal boring machine into a highly versatile unit for job-lot production. Angle plates and similar fixtures will be designed in such manner that the work can be mounted on or within them, and the whole assembly can be moved from one machine to another without disturbing the location of the work within the fixture. Other means of reducing downtime are chip removal without stopping the machine, with chip breakers to facilitate this, duplicate tables, one for loading, one for machining, etc.

PACKAGED UNITS

Ease of maintenance should favor the trend towards construction of many production-type machines from so-called "Packaged Units." These enormously simplify the repair problem. A rough spindle, a bearing gone bad, a built-in motor burned out, occasions no serious interruption on the production line if a duplicate packaged unit is at hand to replace it. Packaged units also permit the machine-tool builder to meet the growing demand for special-purpose machines without completely sacrificing the economies of standardized production.

I predict that hardened and and ground ways, of steel or with hardened-steel inserts, will gradually displace the traditional hand-scraped cast-iron construction. Ways constructed in this manner from alloy steels will outlive cast iron many times, and when wear finally does necessitate overhaul, the repair job is enormously simplified. Such construction, properly designed and tooled, may even be less expensive in the long run than the conventional design. When employed in combination with ball or roller bearing supports, or non-metallic plastic facers, lubrication is simplified and ease of operation is enhanced manyfold.

Greater attention will be paid to coolants and lubrication, both of the cutting tool and of the machine itself. In the high-jet coolant process, the tool is lubricated by means of a high-pressure spray, but the chip is not quenched. Increases in machining time as high as 30% are claimed for the method.

I foresee super-speed fine-surface finish-milling operations coming more and more to the fore. These, and high-speed boring and turning, with diamond tools or carbides, are already producing amazingly smooth and accurate surfaces. The quality of finish which some milling machine builders have attained during the past few years is eye-opening. Of course this type of milling takes the most advanced of heavy, rugged, over-powered machines, but where the production run justifies the investment, they are enormous time-savers. Improved methods of evaluating surface finish will intensify the trend towards higher precision and

finer finishes. In both of these matters, lathes, millers, and boring machines will approach the present potential of grinding machines, in some cases eliminating the need for supplemental finish grinding.

Two somewhat dissimilar trends are evident in the design of spindles. As the latter become larger and heavier, the use of ball and roller bearings for support and thrust will become more commonplace. However, certain European manufacturers of grinding machines are reverting to the plain bearing with mist lubrication for high precision operations. It is an interesting development, which has been carried to a high degree of perfection on some British machine tools. Grinders of this type are produced by Newall in England and Jung in Germany, and possibly some others. When new, these spindles operate with amazing quiet and lack of vibration and produce a beautiful finish, but their life is limited and the least bit of trouble means a factory rebuilding job.

DRIVES & CONTROLS

The development and perfection of electronic and hydraulic mechanisms for machine-tool drive and control has rendered practical the provision of infinite speed and feed changes within the range of the machine. This is highly desirable, but neither hydraulic mechanisms nor electronic controls are yet sufficiently trouble-free. In both instances, the dissipation of heat to avoid distortion of beds and tables still remains something of a challenge to the designer of high-precision machines. Perhaps the development of the transistor as the successor to the vacuum tube will solve the problem so far as electronics are concerned. No such immediate solution appears to be in sight for hydraulic mechanism. Furthermore, many hydraulic mechanisms have a tendency to develop leakage. Inadequately designed or low-quality tubing and fittings in machine-tool hydraulic systems account for a substantial maintenance expense in many a plant, not to mention a lot of costly downtime. Perhaps we could learn something from the designer of aircraft hydraulic mechanisms.

More will be heard of the results of recent research in the rapid cutting of ferrous and nonferrous metals, the disposition of coolants and cutting lubricants, and certain revolutionary developments now far advanced, some here and some abroad, in hitherto unknown methods of removing metal. Among these are a super-speed grinding process developed by Fouquet in France; another is the spark or electrolytic method of metal removal; and finally the flame process, in which the work surface is brought to a red heat ahead of the cutting tool. Another interesting development which holds future promise is that of turning by milling, in which the work is revolved, and the lathe tool is replaced by a rotary multi-toothed cutter.

For many years, the American machine-tool builder has maintained a position of recognized world leadership; now it is a leadership faced with serious challenge from abroad. We must not be complacent or too ready to assume that foreign engineers don't know how to design good tools.

European machine-tool builders have made enormous strides during the past few years, and in open competition with us, already have captured many markets which we formerly dominated. Their sales volume is fully three times any pre-war peak. They are making many excellent machines and selling them at a fraction of our prices.

Some of the progress which we ourselves have made in late years had its inception in Europe. Examples of this are high-speed planing, thread grinding, optical controls, a fair share of the trend towards automaticity, precision profiling by the optical method, and many latter-day developments in gaging. Just as the microscope, now the basis of much of our precision measurement, was a Dutch invention, and the micrometer was developed by Palmer in France, so the influence of the great German firm of Carl Zeiss, now unhappily broken up by the Russians, has been outstanding in the field of fine measurements. Their designs were the real genesis of optics as applied to precision gaging and machine-tool controls. Not until World War II, when they were copied almost in the Chinese manner, so to speak, by England, did any other nation approach the Germans in this field. In it, the Germans and the British still have a big lead over us, and most of our domestic developments are largely copies of European prototypes. Air gages, which now have been brought to a state of evolution in this country not yet equalled in Europe, were nevertheless originally devised by Solex in France shortly after World War I. The initial application of air gages to machine tools themselves to control size and stop the machine on completion of the operation was first tried out in Europe, and I suspect is used there today more widely than it is in this country.

The use of tungsten-carbide planer tools, operating at speeds up to 250 to 300 fpm, was commonplace in England before World War II. At long last we caught up with them and perhaps even improved on European practice; but planer manufacturers would do well to take seriously some further developments in the art making their appearance on the other side of the water. The French firm GSP is now producing a machine which planes in both directions, thus eliminating the lost time in the return stroke.

FULL-AUTOMATIC OPERATION

It is interesting that the Germans seem more intrigued with full-automatic operation than we do. In their country, one hears much about the pushbutton factory of the future, but in mass-production operations, our need for it is really greater than theirs, because of higher labor costs.

In their preoccupation with the pushbutton factory, the Germans have given a great deal of attention to what they call programming machines. Based, for the most part, in electronics, these machines are activated by a series of pushbuttons to perform a multiplicity of preselected operations automatically. Many competent American engineers regard them as dangerously complex and question whether the time they save will be offset by their capital and operating costs, their potential for trouble, and their high maintenance expense. For my part, I think the American mass-producing approach to multiple operations has been much sounder, breaking them down into steps, so that if one machine or component breaks down, it won't interfere with the operation of others.

So much for my seance with the crystal ball. I am thoroughly convinced that America in general, and the machine-tool builder in particular, face a real challenge in the next decade or two. Machine tools are not only "America's muscles"; they are the very cornerstone of our great industrial economy. Their efficiency and performance will determine in large measure whether we can maintain or continue to raise our standard of living in the years to come. And if the cold war should wax hot, American superiority in machine tools could be the tenuous margin between victory and defeat. Thus, in a very considerable sense, America's future rests in the hands of the machine-tool engineer.

ROUND TABLE

Co-op Loot

"What do you think of the profit-sharing plan they brought out at the foremen's meeting, Ed?"

"Boy, is that a bunch of hokum! I hope Harrison can talk the big shots out of it. For my money, it's a waste of good dough."

"Oh, calm down, Ed, I thought it was a good idea. We've all tried various methods of improving production at times, and I think this is one of the best ways."

"Not for my shop, Al. Maybe there are good plans, but I don't like the idea where they put each department down as a unit and each man in the department gets the same bonus. It isn't fair to the men who work hard."

"Well, maybe the plan will make the slackers work harder. And the hard workers may put the pressure on them to get off their tails."

"And start a fight on the shop floor? Not for me, Al. If there's going to be any pushing around my section, I want to do it. At least I have the authority, and damn few of the men would talk back to me if I were really serious. If you let the gang settle their own beefs, you wind up with a free-for-all."

"I think you're borrowing trouble, Ed. After all, you haven't given the idea a chance. Besides, they may not pick up this plan at all; or they may institute another kind of profit-sharing system."

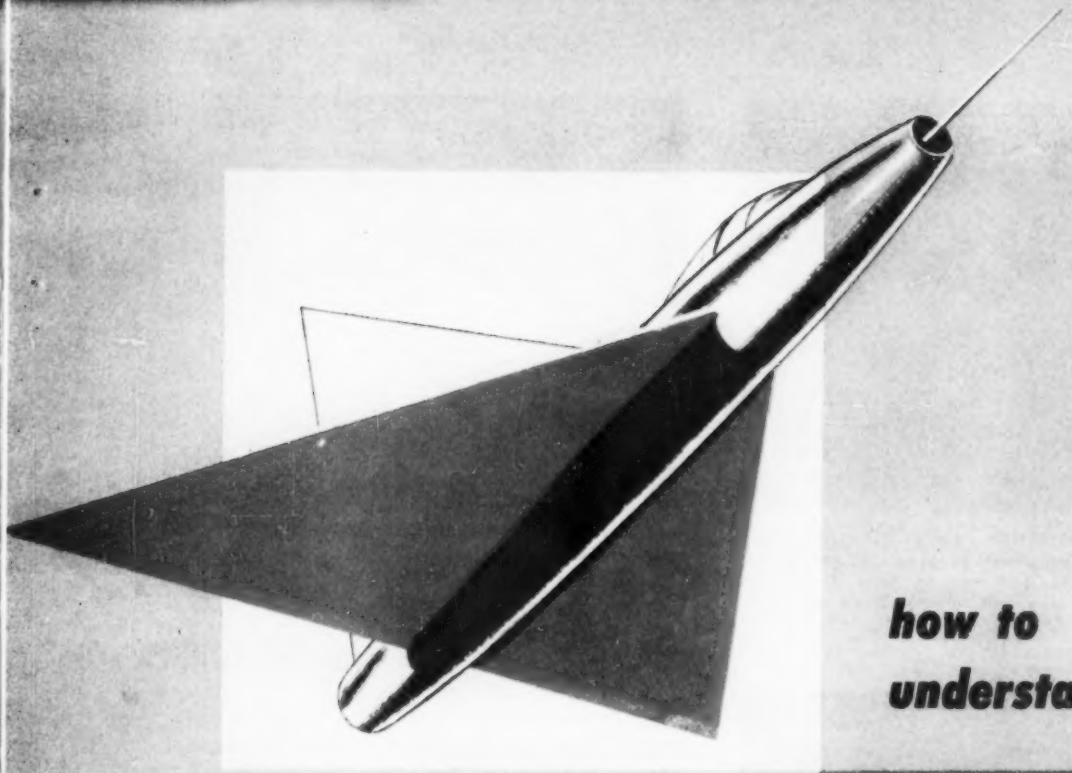
"I hope they give up the whole idea, Al, and just pass out a general increase in pay. This splitting up the gravy may be fun for the boys with the slide rules, but it gives me the willies. I know we'd only be getting into trouble. After all, they should pay the stockholders their dividends, and the working force their wages, and not get the two mixed up."

"I've read where some plants with profit-sharing plans have upped their production rates an awful lot, Ed. I still think there's a lot of value in one that works."

"There you've hit the point, Al—one that works. Show me one that won't cause trouble, and I'll agree."

"How can you tell if we don't at least try it out?"

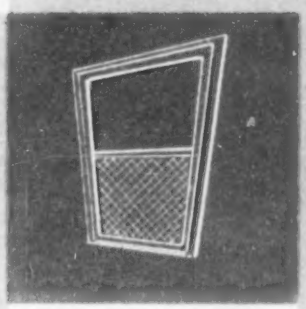
ARE PROFIT-SHARING PLANS good business sense, and do they tend to improve production? Do you side with Ed in disliking the kind that rates each department and divides up the proceeds among the men in that department? Your ideas on the subject may guide others with this problem. Discussions of earlier topics appear on later pages.



how to understand ...

... ALUMINUM

its alloys, and tempers



By SAMUEL STORCHHEIM, Engineer-in-Charge
ATOMIC ENERGY DIVISION
SYLVANIA ELECTRIC PRODUCTS INC, BAYSIDE, NY

Selection and heat-treatment of aluminum and aluminum alloys is, in spite of the quantity of technical information available, a mystifying procedure. While aluminum is second only to iron as a manufacturing metal, techniques and terminology differ widely from those used for steel. Perhaps this difference accounts for the confusion experienced by new users of aluminum. Heat-treatment techniques and alloy characteristics for aluminum and steel are *not* directly comparable. Here, in a minimum of metallurgical terms, is an introduction to the factors necessary to the proper application of aluminum.

American Machinist SPECIAL REPORT NO. 351 TO THE METALWORKING INDUSTRIES

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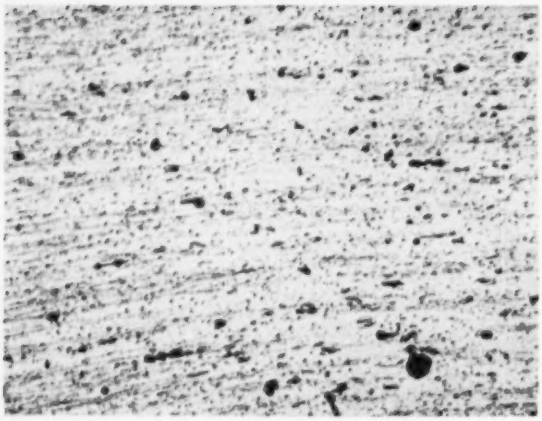


FIG. 1—25 ALUMINUM—AS ROLLED—structure is aligned, striated, in direction of rolling. Grain definition is poor as grains were severely distorted by rolling. Dark areas are holes or inclusions; possibly holes where inclusions were removed during preparation of metallurgical sample

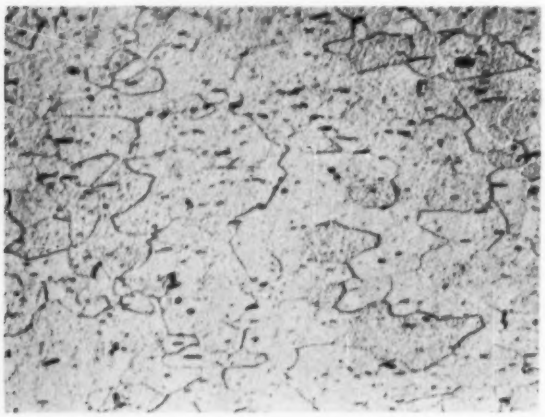


FIG. 2—After anneal, 2S aluminum shows relatively well-defined large grains. Structure is no longer oriented, aligned, in any particular direction. Dark areas are inclusions or pits. Figs 1 and 2 are produced by etching with HCl-HF, 250x

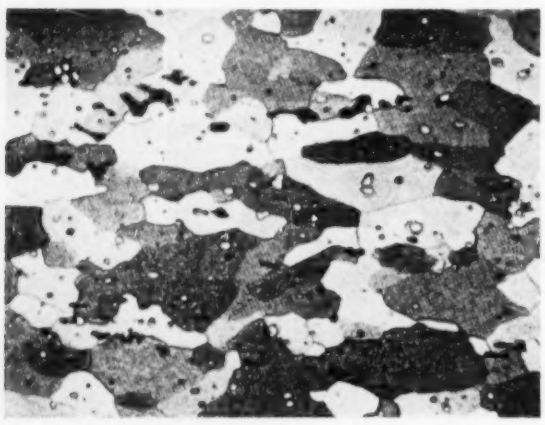


FIG. 3—Cu-Al PARTICLES, white, shown out of solution for a heat-treatable alloy as caused by insufficient temperature

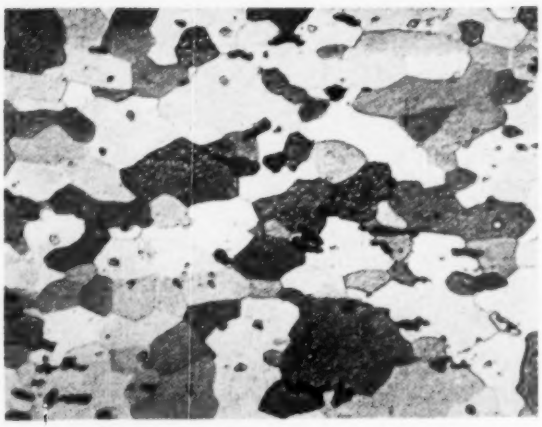


FIG. 4—AT HIGH TEMPERATURE (930-950 F) almost all of Cu-Al particles have dissolved into the matrix

BASIC FORMS

PURE metallic aluminum is silvery in luster. Its crystal structure is face-centered cubic, hence the abundance of slip planes make it very malleable and ductile (*AM*—Sept 28 '53, p. 139). In addition, this material is a good conductor of electricity and heat, provides a good reflective surface, is corrosion resistant, and is light in weight compared with most other structural materials. Aluminum has a density of only 0.0975 lb per cu in.

The relatively low tensile strength of pure aluminum is its one major drawback. While the initial strength of 9000 psi can be doubled by working the metal, work-hardening, it will not otherwise respond to heat-treatment. And even a strength of 18,000 psi is seldom satisfactory, except for cooking-ware, decorative devices, and other non-stressed applications.

However, the strength of aluminum can be greatly increased without too severely reducing its other desirable properties, such as ductility and low weight. This strengthening is accomplished by alloying the aluminum with one or more other metals or metalloids. Wrought alloys of aluminum, already having greater strength than pure Al, are of two types: One group that can be hardened by cold-working (deforming at room temperature) and a second group that will respond to both working and heat-treatment or either one individually. Other aluminum alloys are primarily used in the form of castings, some of which are heat-treatable while some are not heat-treatable. Numerous alloys of Al in the above categories can be obtained from Al producing companies in many conditions of temper. "Temper" is the condition of the alloy produced by heat or mechanical treatment, which causes the alloy to have definite characteristics of structure and mechanical properties. The Al alloys are identified by numbers rather than by names. A particular alloy is seldom used

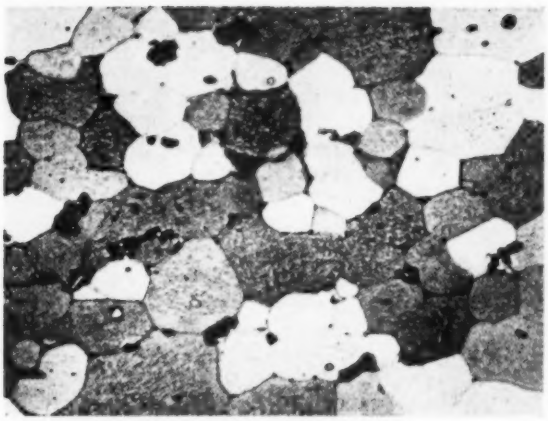


FIG. 5—OVERHEATING THE SAME ALLOY (Fig. 3) results in melting certain constituents at the grain boundaries, shown by dark areas at grain boundaries

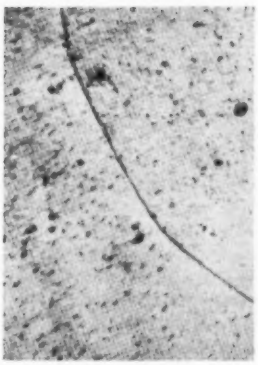


FIG. 6—PROPERLY AGED (392 F for 30 min after solution annealing at 1004 F and quenching) aluminum alloy containing 5% Cu. No precipitate is visible, dark spots are holes or inclusions

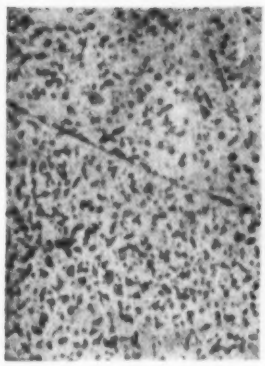


FIG. 7—OVERAGING 5% Cu ALLOY (752 F for 1 hr) produces numerous coarse, precipitated particles. This condition reduces strength, workability, and corrosion resistance

AND THEIR DESIGNATION

for both casting and wrought (cold-worked) products. The primary constituent in an alloy is indicated by the following system:

No.	*Constituent* (alloying element)
0 to 10	manganese, Mn
10 to 30	copper, Cu, (the hardening constituent)
30 to 50	silicon, Si
50 or 70	Mg_2Si
70	zinc, Zn

When the letter S follows the above numbers, the alloy is used for wrought products such as sheet, rivets, and rolled rod. If the letter S is not present, the alloy is used to make castings. When an existing alloy's analysis has been changed to a degree that produces different properties, the newly developed material may be designated by a letter preceding the original number. Thus, a modified 17S alloy would be identified as A17S.

The alloy numerical designation, as described above, has its *temper* indicated by a letter following a hyphen after the number. This letter can, in turn, be followed by one or more digits to specifically define the temper. Here is the nomenclature worked out for the temper designations, letters, and the specific temper numbers:

- -O annealed, recrystallized (wrought products only)
- -F as fabricated
- -H strain hardened
  - -H1, plus one or more digits—strain hardened only
  - -H2, plus one or more digits—strain hardened and then partially annealed
  - -H3, plus one or more digits—strain hardened and then stabilized
- -W Solution heat-treated—unstable temper
- -T Treated to produce stable tempers other than -O, -F, or -H.
  - -T2 annealed (cast products only)
  - -T3 solution heat-treated and then cold-worked
  - -T4 solution heat-treated
  - -T5 artificially aged only
  - -T6 solution heat-treated, then artificially aged
  - -T7 solution heat-treated, then stabilized
  - -T8 solution heat-treated, cold-worked, and then artificially aged
  - -T9 solution heat-treated, artificially aged, and then cold-worked
  - -T10 artificially aged and then cold-worked

This system of temper designations is relatively new. Tables I and II show in more detail both the old and new temper designations for non-heat-treatable and heat-treatable wrought Al alloys, respectively.

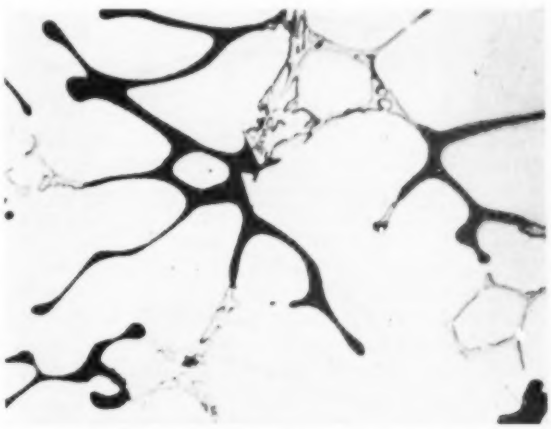


FIG. 8—AS-CAST STRUCTURE PRODUCED BY QUICK CHILLING 245 Al alloy—etched 10% NaOH, 500×

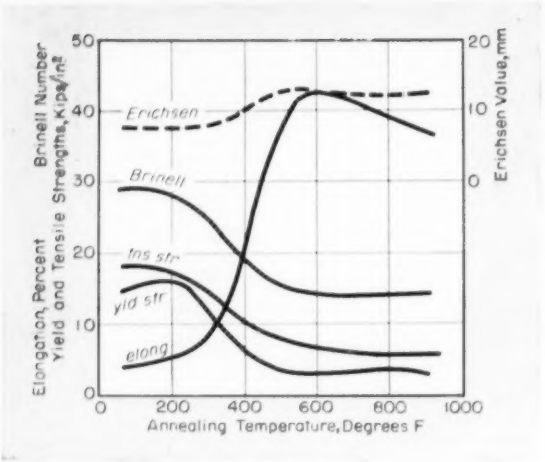


FIG. 9—EFFECT OF ANNEALING on tensile properties, hardness, and Ericksen value of cold-rolled, high purity aluminum sheet — Si 0.002%; Cu 0.0006%; Fe 0.0006%; Sheet is 0.040 in. thick, 87% reduction, annealed 1 hr. Yield strength given for 0.2%

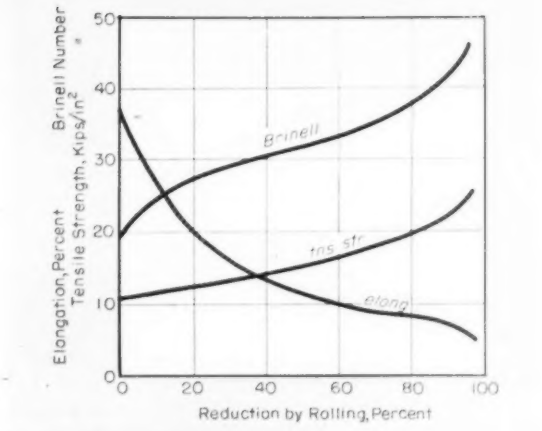
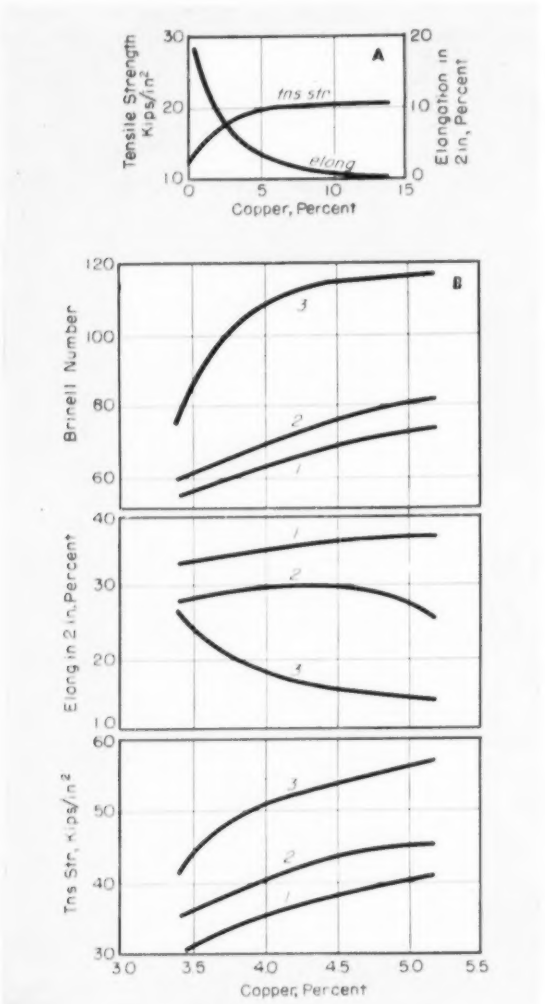


FIG. 10—EFFECT OF COLD-ROLLING on tensile properties and hardness of aluminum sheet



NON-HEAT-TREATABLE WROUGHT ALUMINUM ALLOYS

THESE wrought Al alloys are non-heat-treatable: 2S, 3S, 4S, and 52S, (see Table III for compositions). They are the most commonly used alloys of this category. They will not respond to heat-treatment; will not harden when subjected to a high temperature soak followed by a rapid quench, in turn followed by a low temperature treatment. These alloys can only be hardened by cold-working. Actual strength depends upon the amount of deformation performed on them after the last annealing, or softening, operation. The greater the amount of deformation, the greater the strength developed, and the lower the ductility of the alloy. When the cold-worked alloy is annealed, the properties obtained by cold-working are destroyed and can only be re-obtained by cold-working the alloy again.

Supplied in six tempers, these alloys vary from annealed or soft temper, "O," to the extra-hard temper as designated for the 2S and 3S alloys by

FIG. 11—TENSILE PROPERTIES and hardness of sand-cast and wrought aluminum-copper alloys. A — test bars, ½-in. dia, cast in green sand. B — high purity alloys, hot rolled, solution annealed one hr at 1000 F and water quenched. Curves: 1, as quenched (—W condition); 2, quenched and aged (natural aging) 11 days at room temp; 3, quenched and aged 38 hr at 300 F (artificially aged — T6 condition). ***Time interval*** between soaking and quenching is very critical for some alloys. When solution heat-treating 17 S and 24 S sheet material, the time lapse between removal from the furnace and quenching ***should not exceed 10 sec*** or formability and corrosion resistance will be adversely affected

"H19," and "H39" for the 52S, alloy. Besides these tempers the "F" designation is also used. It indicates the as-fabricated condition, the condition for which no specific effort has been made to control the mechanical properties of the alloy. The properties that are obtained for this temper are reasonably uniform but are not guaranteed.

For similar tempers, the strengths of the alloys 2S, 3S, 4S, and 52S increase in that order; ease of deforming decreases in the same order. The 3S alloy, though it has greater strength than the 2S alloy, costs the same. Hence it is more commonly used than 2S. Typical mechanical properties of all of these alloys are shown in Table IV.

Structures of as-rolled and as-annealed non-heat-treatable Al alloys are shown. Table V gives the annealing cycles used for wrought non-heat-treatable aluminum alloys.

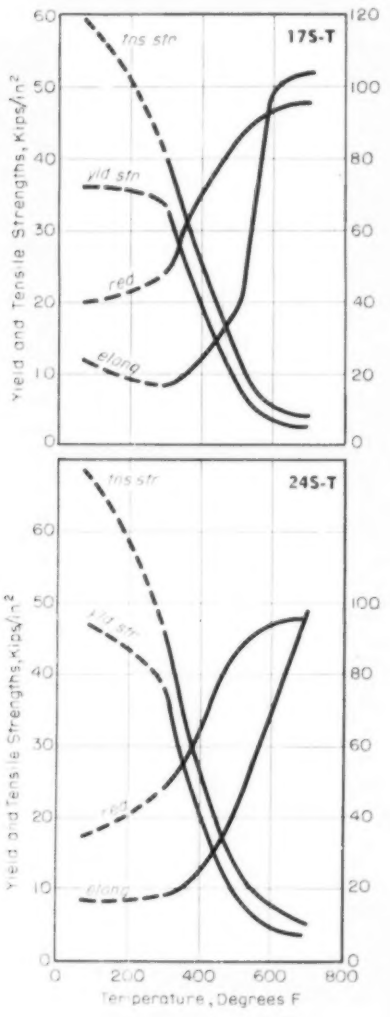


FIG. 12—WROUGHT ALUMINUM — copper — magnesium — manganese alloys (17 and 24 S-T), at high temperatures, have these short-time tensile properties

Non-Heat-Treatable Alloy		Characteristics and Uses
2S	—	is commercial Al of 99.0% purity and is known for its good forming properties. It has a low yield strength and good corrosion resistance; is used for cooking utensils, sheet, and tubing.
3S	—	is an alloy of 1.2% manganese, Mn, content; is similar to the 2S alloy. It is, however, slightly stronger and less ductile; is used to make cooking utensils (less easily dented than 2S) and in sheetmetal work.
4S	—	is 1.2% Mn; 1.0% magnesium, Mg; the balance is Al. This alloy has fairly high strength and its forming properties are fair. Uses include forms of sheet and tubing.
52S	—	contains 2.5% Mg and 0.25% chrome, Cr, balance Al. It has forming properties which are fair plus high strength. 52S is used in a variety of forms including: plate, sheet, rod, wire, pipe, tubing, and bar. A new alloy designated as A54S and containing 3.5% Mg plus 0.25% Cr has the highest strength of any of the non-heat-treatable alloys. It is used in the form of sheet for welded structures.

HEAT-TREATABLE WROUGHT ALUMINUM ALLOYS

IN contrast to the non-heat-treatable aluminum alloys, there are a number of alloys which can be heat-treated to various tempers. Among these are included the alloys: A17S, 17S, 14S, 24S, 53S, and 61S, the chemical compositions of which are listed (Table III). The heat-treatment for these alloys is fundamentally the same. The alloy is heated to a high temperature, rapidly cooled, and then hardened by being reheated again but to a lower temperature than that initially used. The metallurgist would refer to these operations as a "*solution anneal*," followed by a "*quench*," and then by "*artificial aging*," respectively. These operations are so important to the metallurgy of aluminum that a more detailed study may be of value.

SOLUTION ANNEAL

When various metals are added to other metals to form alloys they can do a number of things. They can form new phases such as solid solutions (similar to sugar in tea) or intermetallic compounds (cementite, Fe_3C, in steel) with the parent metal. These new forms can dissolve in the base metal completely or, depending upon temperature, to a limited extent. Or they can remain in the host metal as discrete particles retaining their original identity, which simply means they do not react or alloy with the base metal.

For the heat-treatable aluminum alloys the added metals fall into the former category where the newly

formed phases are partially soluble in the aluminum. That is, as the temperature is raised more and more of the new phase is dissolved in the Al until for all practical purposes it is completely in solution. Thus, if the structure of the alloy were seen at a low temperature both the new phase and the parent phase, matrix, would be seen. Raising the temperature would cause the microstructure to change such that in viewing it less of the new phase would be visible. This procedure would continue until only the parent metal would be evident. Figs. 3 and 4 show this effect clearly with Fig. 3 exhibiting the new phase CuAl, white particles, out of solution and Fig. 4 showing almost complete solution of the CuAl particles in the matrix. Hence, a solution anneal consists of heating a heat-treatable alloy, to about 950 F, so that all the new phase material is in solution with the matrix. As the temperature of solution anneal is increased, this process becomes more rapid. The primary limitation to continued increase of temperature is the avoidance of the beginning of melting within the alloy. This is better known as "burning" and results in loss of ductility. In severe cases blisters are produced which reduce the alloy's strength. Fig. 5 depicts the effect of overheating.

Too low a solution anneal temperature either does not dissolve all of the new phase or else it takes too long to dissolve the phase. This latter reason of course limits a low temperature solution anneal from a practical standpoint.

QUENCHING

To let the solution-heat-treated alloy cool slowly to room temperature would allow the new phase just placed in solution to come out as relatively large particles. (An analogous situation would be to heat water and dissolve sugar in it, to "solution anneal" the sugar into the water. Cooling this solution slowly would allow crystals of sugar to come out of the solution in the form of "rock candy"). This condition of large particles in the matrix would bring the alloy back to where it was prior to the solution anneal and nothing would be gained. Fortunately, the rate of movement of atoms in solid metals, diffusion, is relatively slow when compared to liquids or gases. If it were possible to "freeze" the atoms of the new material in solution with the Al, the condition established by the solution anneal would be retained. Then the new phase's atoms would be immobilized and would not break out of solution. This is done by cooling the solution annealed alloy very rapidly, quenching it in cold water. The condition that now exists is one of super saturation. The alloy is at such a temperature that normally little, if any, of the new phase would be in solution with the Al. However, because it all *is* in solution it is striving to get out; it is attempting to go from its present non-equilibrium state to one of equilibrium.

AGING OR PRECIPITATION HARDENING

The metallurgist by use of a low-temperature heat-treatment, aging treatment, following the quench of the solution annealed alloy, causes the new phase to come out of solution, precipitate, but at a controlled size in a controlled dispersion. Thus the particles are no longer randomly distributed in large particle sizes but rather as very tiny platelets, usually invisible even under the microscope. These tiny platelets are very evenly distributed throughout the matrix. This latter condition of fine sized particles uniformly dispersed causes the alloy's hardness and strength to increase very perceptibly. Ductility usually declines while resistance to corrosion also decreases.

Some of the heat-treatable Al alloys solution annealed and quenched do not even require a low temperature precipitation treatment. They start precipitating at room temperature. Thus those alloys that are aged at a slightly elevated temperature, say 350 F for about eight hours, are termed "artificially aged" while those that precipitate at room temperature are referred to as "naturally aged."

FROZEN ALLOYS

To retard the naturally aging alloys from aging, the atom mobilities are further reduced by freezing the alloy, using mechanical refrigeration or "dry-ice." At 32 F aging is retarded several hours. Dry ice (−50 to −100 F) delays aging for an even longer period. If an artificially aged alloy is aged at too high a temperature or for too long a period of time, the precipitated particles grow until they are visible under the microscope. This condition is referred to as "overaging" and advantages gained by a proper precipitation treatment are lost.

One of the best known precipitation hardened aluminum alloys is 24S, which contains 4.5% copper. This alloy is heated, soaked (to put the copper into solution with the aluminum at 910-930 F), then quenched in cold water. The alloy is precipitated, aged, at 375 ± 5 F for 9 or 12 hr. The particles pre-

table I. Temper designations for strain hardened wrought aluminum alloys that are not heat-treatable*

Old Temper Designation	New Temper Designation†		
	Strain Hardened Only	Strain Hardened and Then Partial Annealed	Strain Hardened and Then Stabilized
	Alloys 2S and 3S		
1/4H	−H12	−H22	
1/2H	−H14	−H24	
3/4H	−H16	−H26	
H	−H18	H28	
Extra Hard (Not standard)	−H19		
	Alloys 4S, 52S and 56S††		
1/4H			−H32
1/2H			−H34
3/4H			H36
H			H38
Extra Hard (Not Standard)			H39

* Alloys listed are also available in −O and −F tempers

† The tempers shown are standard for the alloys listed

†† The alloys 4S, 52S, and 56S may also be obtained in the −H1 and −H2 type conditions

table II... Temper designations for heat treated wrought aluminum alloys

Alloy	Old Temper Designation	New Temper Designation											
		Sheet and Plate*				Extrusions*		Wire, Rod and Bar*	Tubing*‡‡		Forgings‡	Rivets	
		Flat Sheet	Coiled Sheet	Plate									
		A	A	A	C	A	C	A	A	C	A	A	D
11S	–W							–T4					
	–T3							–T3					
	–58							–T8					
14S and clad 14S:	–W	–T3	–T4	–T4	–T4	–T4	–T42	–T4			T4		
	–T	–T6	–T6	–T6	–T6	–T6	–T62	–T6			T6		
	–T										T61*‡‡		
17S	–T												T3 or V
	–T							T4				T4	T3 or V
	Any Temper												T41**
A17S	–T											T4	T3 or V
18S	–T										T61*‡‡		
24S and clad 24S:	–T	–T3	–T4	–T4	–T4	–T4	–T42	T4	T3	T4		T4	T3 or V
	–RT	–T36		–T36				T36					
	–T80		–T6		–T6								
	–T81	–T81											
	–T86	–T86		–T86									
25S and 32S	–T										T6		
A 51S	–W										T4		
	–T										T6		
53S	–W					–T4	–T4				T4	T4	T4
	Any Temper												T41**
	–T					–T6	–T6				T6	T6	T6
	–T5					–T5							
	–T61											T61	T61
61S	–W	–T4	–T4	–T4	–T4	–T4	–T4	–T4	–T4	T4			
	–T	–T6	–T6	–T6	–T6	–T6	–T6	–T6	–T6	–T6		T6	T6
	–T5					–T5							
	–T62					–T62							
	–T81							–T81					
63S	–T					–T6	–T6						
	–T5					–T5	–T5						
75 S and Alclad 75S:	–W	–W**	–W**	–W**	–W**	–W**	–W**						
	–T	–T6	–T6	–T6	–T6	T6	T6	T6					

A, heat treated by the producer. C, heat treated by the manufacturer of the finished product. D, driven rivets.
*Products listed are available also in –O and –F tempers. ‡Forgings are available also in –F temper. ‡‡For extruded tubing see columns for extrusions. •F. B. – Boiling water quench. •F. V. – Driven cold after full natural aging. •F. S. – Driven cold immediately after solution heat treatment, or when refrigerated to defer natural aging. **Driven hot, at the solution heat treating temperature. ••To be specific, the time of natural aging must be stated – for example, 75 S-W (2 hr), 75 S-W (2 months). ‖Available only in sheet and plate.

cipitating out of the aluminum are not pure copper but rather a copper-aluminum alloy, $CuAl_2$.

One very serious disadvantage of the precipitated 24S alloy is its poor resistance to corrosion. The alloy in this condition corrodes along its grain boundaries until the metal fails. During aging, $CuAl_2$ particles form at grain boundaries. This means that in the immediate vicinity of the $CuAl_2$ particles, the surrounding metal is depleted in copper. It has less copper than the rest of the alloy. The $CuAl_2$ particles act as if they were cathodic, the minus pole in a battery. The areas of purer aluminum surrounding the $CuAl_2$ particles behave as anodes, the positive or plus poles of a battery. All that is required to set up the battery action of current flow is a conducting liquid. Hence when moisture is present an electric cell starts operating in the alloy. When this happens, the anodic areas, purer aluminum at the grain boundaries, are eaten out, or "corroded" away. This process, also known as galvanic corrosion, continues along the grain boundaries until there is practically nothing left holding the grains together. Naturally, an alloy in this condition, if slightly stressed, will fall apart or fail.

To avoid intergranular corrosion of the 24S alloy it is necessary to keep moisture away from the grain boundaries. This is accomplished by coating, better known as cladding, the alloy with a thin layer of pure aluminum. The pure aluminum has excellent corrosion resistance; thus protects the 24S alloy. This form of the alloy is best known by the names of Alclad or Duraluminum.

Several heat-treating cycles for the aluminum alloys responding to heat-treatment are given in Table VI. Mechanical properties of these alloys are given in Table IV. Some typical alloy characteristics and uses are:

Heat-Treatable Alloy — Characteristics and Uses

24S — is composed of 4.5% copper, Cu; 0.6% Mn; 1.5% Mg; balance Al; and is known for its high strength. It is obtainable in practically all wrought forms and can be made into strong extrusions of good ductility. Obtained in clad form, the alloy designation is Clad 24S.

14S — contains 4.4% Cu; 0.8% silicon, Si; 0.8% Mn; 0.4% Mg; balance Al. It is an alloy which can be made into high strength extrusions with fair ductility, as well as into high strength forgings.

17S — contains 4% Cu; 0.5% Mn; 0.5% Mg; balance Al and is used to make free-cutting screw-machine products.

53S — comprises 0.7% Si; 1.3% Mg; 0.25% Cr; balance Al. It is the heat-treatable alloy producing extrusions of highest strength in this group of alloys. The extrusions made from it have a fair degree of ductility.

61S — The nominal composition of this alloy is 0.25% Cu; 0.6% Si; 1.0% Mg; 0.15% Cr; balance Al. Its forming properties are very good; its strength is fair. Resistance to corrosion is intermediate. With the exception of forgings, 61S is available in all wrought forms.

CAST ALUMINUM ALLOYS

URE aluminum is practically never used in the production of castings. This is based upon two important reasons: (1) It has low strength, as-cast, and cannot be heat-treated to greater strength. (2) Pure Al has poor casting properties. About the only castings made using commercially pure aluminum are those needed for the higher electrical conductivity of the pure metal. Cable clamps and induction-motor rotors are examples of these castings.

To improve its castability and strength, aluminum is alloyed. The principal addition agents are: silicon, Si; magnesium, Mg; copper, Cu; zinc, Zn; and manganese, Mn. In addition, nickel Ni; lead, Pb; tin, Sn; bismuth, Bi; chromium, Cr and titanium, Ti are sometimes used to obtain special alloy characteristics. Almost always, the total quantity of alloying agents added to aluminum for castings is greater than for wrought material.

These agents, added singly or in combination to some of the casting alloys, also enable the alloys to be precipitation hardened as previously discussed. The strengths developed in heat-treated castings, however, are lower than those developed in wrought alloys. A strength greater than 80,000 psi can be attained in heat-treated wrought alloys as compared to about 50,000 psi for the best heat-treated cast alloys.

An inherent feature in many of the as-cast structures, as well as in cast alloys to be wrought, is that of non-homogeneous composition distribution. This can be detrimental not only to the ability of an alloy to be subsequently aged or wrought but can adversely affect the properties of a non-heat-treatable alloy. Non-uniformity of composition occurs as follows:

CAST STRUCTURE

Invariably a molten alloy does not exhibit a sharp, distinct, freezing point. Rather, the alloy solidifies a little at a time as the temperature of the melt is lowered. The solidified portion is not representative of the composition of the original, totally-molten alloy but rather is richer in one of the constituents. For example, the first part of an alloy of 95% Al and 5% Si solidifies at about 1130 F and is a single constituent or phase called *alpha* of about 99% Al and

table III... Nominal Composition of Wrought Alloys*

Alloy	% of Alloying Elements - Aluminum and Normal Impurities Constitute Remainder								
	Copper	Silicon	Manganese	Magnesium	Zinc	Nickel	Chromium	Lead	Bismuth
EC	99.45% minimum Aluminum								
2S	99% minimum Aluminum								
3S†	...	...	1.2	...	...	...	...	...	...
4S†	...	...	1.2	1.0	...	...	...	...	...
11S	5.5	...	...	...	...	...	...	0.5	0.5
14S†	4.4	0.8	0.8	0.4	...	...	...	...	...
17S	4.0	...	0.5	0.5	...	...	...	...	...
A17S	2.5	...	...	0.3	...	...	...	...	...
18S	4.0	...	...	0.6	...	2.0	...	...	...
B18S	4.0	...	...	1.5	...	2.0	...	...	...
24S†	4.5	...	0.6	1.5	...	...	...	...	...
25S	4.5	0.8	0.8	...	...	...	...	...	...
32S	0.9	12.2	...	1.1	...	0.9	...	...	...
43S	...	5.0	...	...	...	...	...	...	...
B50S	...	...	...	1.2	...	...	...	...	...
A51S	...	1.0	...	0.6	...	...	0.25	...	...
52S	...	...	...	2.5	...	...	0.25	...	...
53S	...	0.7	...	1.3	...	...	0.25	...	...
56S	...	...	0.1	5.2	...	...	0.1	...	...
61S	0.25	0.6	...	1.0	...	...	0.25	...	...
62S	0.25	0.6	...	1.0	...	...	...	...	...
63S	...	0.4	...	0.7	...	...	...	...	...
72S	...	...	...	...	1.0	...	...	...	...
75S†	1.6	...	...	2.5	5.6	...	0.3	...	...

* Heat-treatment symbols have been omitted because composition does not vary for different heat-treatment practices.

† The clad form of these alloys consists of a "core" of the basis alloy coated with pure aluminum or a suitable alloy.

1% Si. As the melt is further cooled, more of it solidifies out upon the initially solidified Al-rich sections. The newly solidified portion is less rich in Al than the initial part that solidified; however, it is still not the normal composition. When the melt is half solidified at a temperature of approximately 1095 F, the portion that has just solidified is composed of about 98.5% Al and 1.5% Si. Finally, the last small bit of molten alloy solidifies at approximately 1075 F. Instead of just one constituent, *alpha phase*, freezing out last, two phases, *alpha* and *beta*, come out!

This latter combination for Al and Si is known as the *eutectic* of the system and is the lowest melting point found in the system regardless of what composition is used. The *eutectic* is actually a mechanical mixture of the two phases and, in most alloy systems, where it forms is quite brittle. The alpha of the eutectic represents a soft ductile alloy of approximately 98% Al and 1% Si while the beta phase is an extremely brittle alloy of about 1.5% Al and 98.5% Si. (Fortunately the eutectic in this case contains only about 10% beta phase.)

This certainly is dramatic evidence of how an alloy can have a non-uniform compositional distribution. It is possible, by very rapid cooling to change solidification temperatures as well as compositional differences. Normally, the faster the freezing of the melt, the greater is the non-uniformity of structural composition.

SOLUTION ANNEALING — CASTING ALLOYS

To alleviate this condition of non-uniformity, usually referred to as coring, the alloy can be solution annealed. It is heated for a long time, soaked at a high temperature, said temperature being below the melting point of *the last segment of alloy to solidify*. If this is not done melting of this portion occurs and the result is a loss in ductility. In extreme cases strengths are reduced, cracking during quenching occurs, and blisters can form. This partial melting of these alloys is referred to by a number of terms including: roset-

Table IV . . . Mechanical properties of wrought alloys[1]

Alloy and Temper	Tensile Strength psi	Yield Strength (offset 0.2%), psi	Elongation, % in 2 in.		Brinell Hardness, 500-kg. Load 10-mm. Ball	Shearing Strength, psi	Endurance Limit,[2] psi
			Sheet Specimen (1/16 Inch Thick)	Round Specimen (1/2 Inch Diameter)			
Non-Heat-treatable							
2S-O	13,000	5,000	35	45	23	9,500	5,000
2S-H12	15,500	14,000	12	25	28	10,000	6,000
2S-H14	17,500	16,000	9	20	32	11,000	7,000
2S-H16	20,000	18,000	6	17	38	12,000	8,500
2S-H18	24,000	22,000	5	15	44	13,000	8,500
3S-O	16,000	6,000	30	40	28	11,000	7,000
3S-H12	19,000	17,000	10	20	35	12,000	8,000
3S-H14	21,500	19,000	8	16	40	14,000	9,000
3S-H16	25,000	22,000	5	14	47	15,000	9,500
3S-H18	29,000	26,000	4	10	55	16,000	10,000
Clad 3S	Properties substantially same as for 3S						
4S-O	26,000	10,000	20	25	45	16,000	14,000
4S-H32	31,000	22,000	10	17	52	17,000	14,500
4S-H34	34,000	27,000	9	12	63	18,000	15,000
4S-H36	37,000	31,000	5	9	70	20,000	15,500
4S-H38	40,000	34,000	5	6	77	21,000	16,000
Clad 4S	Properties substantially same as for 4S						
11S-T3[3]	55,000	48,000		15	95	32,000	18,000
11S-T6	57,000	39,000		17	97	34,000	18,000
11S-T8	59,000	45,000		12	100	35,000	18,000
A51S-T6	48,000	43,000		17	100	32,000	11,000
52S-O	27,000	12,000	25	30	45	18,000	17,000
52S-H32	34,000	27,000	12	18	62	20,000	17,500
52S-H34	37,000	31,000	10	14	67	21,000	18,000
52S-H36	39,000	34,000	8	10	74	23,000	18,500
52S-H38	41,000	36,000	7	8	85	24,000	19,000
Heat-treatable							
14S-O	27,000	14,000		18	45	18,000	13,000
14S-T4	62,000	40,000		20	105	38,000	20,000
14S-T6	70,000	60,000		13	135	42,000	18,000
Clad 14S-O	25,000	10,000	21			18,000	
Clad 14S-T3	63,000	40,000	20			37,000	
Clad 14S-T4	61,000	37,000	22			37,000	
Clad 14S-T6	68,000	60,000	11			41,000	
17S-O	26,000	10,000		22	45	18,000	13,000
17S-T4	62,000	40,000		22	105	38,000	18,000
A17S-T4	43,000	24,000		27	70	28,000	13,500
18S-T61	61,000	46,000		12	120	39,000	17,000
B18S-T72	48,000	37,000		11	95	30,000	
24S-O	27,000	11,000	19	22	47	18,000	13,000
24S-T3	70,000	50,000	18		120	41,000	20,000
24S-T4	68,000[4]	48,000	20	19	120	41,000	20,000
24S-T36	72,000	57,000	14		130	42,000	18,000
Clad 24S-O	26,000	11,000	19			18,000	
Clad 24S-T3	64,000	44,000	18			40,000	
Clad 24S-T4	64,000	42,000	19			40,000	
Clad 24S-T36	67,000	53,000	11			41,000	
Clad 24S-T81	65,000	60,000	6				
Clad 24S-T86	70,000	66,000	6				
53S-O	16,000	8,000		35	26	11,000	8,000
53S-T4	30,000	20,000		21	62	18,000	13,000
53S-T5	27,000	21,000		15	60	17,000	
53S-T6	37,000	32,000		13	80	23,000	13,000
61S-O	18,000	8,000	22	30	30	12,500	9,000
61S-T4	35,000	21,000	22	25	65	24,000	13,500
61S-T6	45,000	40,000	12	17	95	30,000	13,500

[1] The values given in this table are averages which take into account the variations introduced by size, shape, e... method of manufacture. For guaranteed minimum values, see other sources.
[2] Based on 500,000,000 cycles of completely reversed stress using the R. R. Moore type machine and specimen.
[3] For sizes up to 1½ in. For larger sizes, the strengths will be somewhat lower.
[4] The strengths of extrusions more than about ¾ in. thick will be 15 to 20% higher.

We gratefully acknowledge use of tables and illustration from Aluminum Company of America and Reynolds Metals Company

ting, eutectic melting, grain boundary melting, and incipient melting.

CASTINGS FOR WROUGHT ALLOYS

For wrought alloys, where the non-uniform structure is not excessive, it is possible to remove the cast structure by hot-working. Here the alloy is deformed at the high temperatures where greater plasticity of the alloy is obtained. The embrittling effect of the non-homogeneous cast structure is very considerably lowered. By hot-working the alloy, the non-uniform structure is broken up and the atoms can migrate, diffuse more readily, so that the alloy becomes much more uniform in compositional make-up. Usually, with complex cast alloy ingots, where the coring is severe, the ingots are first preheated to about 900 to 975 F for 4 to 12 hours to remove the cored structure. They can then be directly hot-rolled or allowed to cool for subsequent reheating and hot-working.

table V... Annealing cycles

	To Soften After Heat Treatment*			To Remove Cold Work		
Alloy	Soaking Temperature F	Soaking Time Hours	Cooling Rate**	Soaking Temperature F	Soaking Time Hours	Cooling Rate**
2S		Not Heat Treated		650 ± 15	½-2	A or B
3S		Not Heat Treated		750 ± 15	½-2	A or B
14S	775 ± 25	2	B	650 ± 10	½-2	A
17S	775 ± 25	2	B	650 ± 10	2	A
24S clad	775 ± 25	2	B	650 ± 10	2	A
24S	775 ± 25	2	B	650 ± 10	2	A
52S		Not Heat Treated		650 ± 10	2	A or B
53S	775 ± 25	2	B	650 ± 10	2	A or B
61S	775 ± 25	2	B	650 ± 10	2	A or B

**Annealing cooling rates: A—Air cool.
B—Furnace cool 50 F/hr to 500 F.
C—Air cool to 450 F; soak 4 hr. at 450 F.

* Maximum drawability can not be obtained without mechanical working and subsequent re-annealing.

table VI... Heat-treating cycles — wrought Al-alloys

	Solution Heat-Treatment			Precipitation Treatment (Aging)		
Alloy	Soaking temp F	Quench	Temper designation	Aging temp F	Aging time hours	Temper designation
14S	930–945	Cold water	—T4	360 ± 5 350 ± 5 340 ± 5 320 ± 5	5 8 10 18	—T6
17S	930–950	Cold water	—T4	—	—	—
24S	910–930	Cold water	—T4	375 ± 5	12 or 9	—T81 or —T86
53S	960–980	Cold water	—T4	320 ± 5 350 ± 5	18 8	—T6
61S	960–980	Cold water	—T4	320 ± 5 350 ± 5	18 8	—T6

table VII. Typical hot working temperatures for aluminum alloys

	Sheet and Plate			Blooming Mill		
	Breakdown temp F	Continuous Rolling, temp F	Extrusion, temp F	Breakdown, temp F	Hammer Forging, temp F	Press Forging, temp F
2S, 3S, 4S, 52S	750 to 925	300 to 850	750 to 900	750 to 850	680 to 840	680 to 840
14S, 17S, 24S	750 to 850	600 to 850	650 to 850	775 to 850	760 to 820	800 to 860
18S, 25S				800 to 870	760 to 820	800 to 860
32 S, A 51S, 53S, 61S, 63S	750 to 850	700 to 900	700 to 900	800 to 890	800 to 860	820 to 880

table VIII... Nominal Composition of Sand-Casting Alloys*

Alloy	% of Alloying Elements — Aluminum and Normal Impurities Constitute Remainder				
	Copper	Silicon	Magnesium	Zinc	Nickel
43	.....	5.0	.....	.....	.....
108	4.0	3.0	.....	.....	.....
112	7.0	.....	.....	1.7	.....
113	7.0	2.0	.....	1.7	.....
122	10.0	.....	0.2	.....	.....
142	4.0	.....	1.5	.....	2.0
195	4.5	0.8	.....	.....	.....
212	8.0	1.2	.....	.....	.....
214	.....	.....	3.8	.....	.....
B214	.....	1.8	3.8	.....	.....
F214	.....	0.5	3.8	.....	.....
220	.....	.....	10.0	.....	.....
319	3.5	6.3	.....	.....	.....
355	1.3	5.0	0.5	.....	.....
356	.....	7.0	0.3	.....	.....
A612	0.5	.....	0.7	6.5	.....

* Heat-treatment symbols have been omitted because composition does not vary for different heat-treatment practices.

table IX... Nominal Composition of Permanent-Mold Casting Alloys*

Alloy	% of Alloying Elements — Aluminum and Normal Impurities Constitute Remainder					
	Copper	Silicon	Magnesium	Zinc	Nickel	Tin
43	.....	5.0	.....	.....	.....	.....
A108	4.5	5.5	.....	.....	.....	.....
113	7.0	~~2.0~~	.....	.....	.....	.....
C113	7.0	3.5	.....	.....	.....	.....
122	10.0	.....	0.2	.....	.....	.....
A132	0.8	12.0	1.2	.....	2.5	.....
D132	3.5	9.0	0.8	.....	0.8	.....
138	10.0	4.0	0.3	.....	.....	.....
142	4.0	.....	1.5	.....	2.0	.....
B195	4.5	2.5	.....	.....	.....	.....
A214	.....	.....	3.8	1.8	.....	.....
333	3.8	9.0	.....	.....	.....	.....
355	1.3	5.0	0.5	.....	.....	.....
356	.....	7.0	0.3	.....	.....	.....
C612	0.5	.....	0.35	6.5	.....	.....
750	1.0	.....	.....	.....	1.0	6.5

* Heat-treatment symbols have been omitted because composition does not vary for different heat-treatment practices.

table XI... Mechanical Properties of Sand-Casting Alloys*

Alloy	Minimum Values for Specifications		TYPICAL VALUES (Not Guaranteed)						
	Tensile Strength, psi	Elongation, Per Cent in 2 In.	Tensile Strength, psi	Tensile Yield Strength (Offset = 0.2%), psi	Elongation, Per Cent in 2 In.	Compressive Yield Strength† (Offset = 0.2%), psi	Brinell Hardness, 500-kg. Load 10-mm. Ball	Shearing Strength, psi	Endurance Limit, R. R. Moore Type Specimen, 500,000,000 Cycles, psi
43	17,000	3.0	19,000	8,000	8.0	9,000	40	14,000	8,000
108	19,000	1.5	21,000	14,000	2.5	15,000	55	17,000	11,000
112	19,000	††	24,000	15,000	1.5	16,000	70	20,000	9,000
113	19,000	††	24,000	15,000	1.5	16,000	70	20,000	9,000
122-T61	30,000	††	41,000	40,000	⊛	43,000	115	32,000	8,500
142-T21	23,000	††	27,000	18,000	1.0	17,000	70	21,000	6,500
142-T571	29,000	††	32,000	30,000	0.5	34,000	85	26,000	.....
142-177	21,500	††	30,000	23,000	2.0	24,000	75	24,000	10,500
195-T4•	29,000	6.0	32,000	16,000	8.5	17,000	60	26,000	7,000
195-T6	32,000	3.0	36,000	24,000	5.0	25,000	75	30,000	7,500
195-T62	36,000	††	40,000	34,000	1.5	36,000	95	32,000	8,000
212	19,000	††	23,000	14,000	2.0	14,000	65	20,000	9,000
214	22,000	6.0	25,000	12,000	9.0	12,000	50	20,000	7,000
B214	17,000	††	20,000	13,000	2.0	14,000	50	17,000	.....
F214	17,000	††	21,000	12,000	3.0	13,000	50	17,000	.....
220-T4	42,000	12.0	46,000	25,000	14.0	26,000	75	33,000	8,000
319-F	23,000	††	27,000	18,000	2.0	19,000	70	22,000	10,000
319-T6	31,000	1.5	36,000	24,000	2.0	25,000	80	29,000	10,000
355-T51	25,000	††	28,000	23,000	1.5	24,000	65	22,000	7,000
355-T6	32,000	2.0	35,000	25,000	3.0	26,000	80	28,000	9,000
355-T61	36,000	††	39,000	35,000	1.0	37,000	90	31,000	9,500
355-T7	35,000	††	38,000	36,000	0.5	38,000	85	28,000	10,000
355-T71	30,000	††	35,000	29,000	1.5	30,000	75	26,000	10,000
356-T51	23,000	††	25,000	20,000	2.0	21,000	60	20,000	7,500
356-T6	30,000	3.0	33,000	24,000	3.5	25,000	70	26,000	8,500
356-T7	31,000	††	34,000	30,000	2.0	31,000	75	24,000	9,000
356-T71	25,000	3.0	28,000	21,000	3.5	22,000	60	20,000	.....
A612	32,000⊛	2.0⊛	35,000••	25,000••	5.0••	.....	75••	.....	8,000

* Tension and hardness values obtained from standard half-inch diameter tensile test specimens, individually cast in green sand molds, and tested without machining off the surface. The modulus of elasticity varies somewhat with the alloy, but an average value of 10,300,000 psi can be used for most calculations.

† Results of tests on specimens having an l ÷ r ratio of 12.

†† Not required. The error in determining elongations of 1% or less is comparable with the value being measured.

• On standing at room temperature for several weeks, the properties will approach those of the T6 condition.

⊛ Less than 0.5%.

⊛ Based on tests made from 5 to 7 days after casting.

•• From tests made approximately 30 days after casting.

table X... Nominal Composition of Die-Casting Alloys

Alloy	Alloying Elements – % Aluminum and Normal Impurities Constitute Remainder		
	Copper	Silicon	Magnesium
13	.....	12.0	.....
43	.....	5.0	.....
85	4.0	5.0	.....
218	.....	.....	8.0
360*	.....	9.5	0.5
380*	3.5	9.0	.....
384	3.8	12.0	.....

* The alloys A360 and A380 have the same nominal compositions as 360 and 380, respectively, but the impurities, notably iron, are controlled to closer limits.

TYPES OF CAST ALLOYS

ALUMINUM alloy castings can be made by the sand-casting, permanent-mold, or die-casting techniques. Representative compositions of alloys used for the various casting methods are listed.

Al-Cu and Al-Cu-Si alloy castings made of alloys containing approximately 8% of copper and small controlled quantities of iron, silicon, and zinc have improved uniform casting and machining qualities. Some of these alloys can be heat-treated to considerably improve their ductility and strength. A 10% Cu alloy has been developed which has good high temperature strength as well as good wear resistance and hardness.

A series of aluminum-copper-silicon alloys have been developed which contain 3 to 8% Si and less than 5% Cu. These alloys have casting characteristics which are better than the above discussed Al-Cu alloys. This improved casting characteristic is brought about by the high silicon content. The copper in these alloys allows for improved machin-

table XII... Mechanical Properties of Permanent-Mold Casting Alloys*

Alloy	Minimum Values for Specifications		TYPICAL VALUES (Not Guaranteed)						
	Tensile Strength psi	Elongation, in 2 in. %	Tensile Strength, psi	Tensile Yield Strength (Offset = 0.2%), psi	Elongation, in 2 in. %	Compressive Yield Strength† (Offset = 0.2%), psi	Brinell Hardness, 500-kg. Load 10-mm. Ball	Shearing Strength, psi	Endurance Limit, R.R. Moore Type Specimen, 500,000,000 Cycles, psi
43	21,000	5.0	23,000	9,000	10.0	9,000	45	16,000	.....
A108	24,000	††	28,000	16,000	2.0	17,000	70	22,000	.....
113	24,000	††	28,000	19,000	2.0	20,000	70	22,000	.....
C113	25,000	††	30,000	24,000	1.0	25,000	80	24,000	9,500
122-T551	30,000	††	37,000	35,000	⊛	40,000	115	30,000	8,500
122-T65	40,000	††	48,000	36,000	⊛	36,000	140	36,000	9,000
A132-T551	31,000	††	36,000	28,000	0.5	28,000	105	28,000	13,500
A132-T65	40,000	††	47,000	43,000	0.5	43,000	125	36,000	.....
D132-T5	31,000	††	36,000	28,000	1.0	28,000	105	28,000	13,500
138	26,000	††	30,000	24,000	1.5	30,000	100	24,000	.....
142-T571	34,000	††	40,000	34,000	1.0	34,000	105	30,000	10,500
142-T61	40,000	††	47,000	42,000	0.5	44,000	110	35,000	9,500
B195-T4*	33,000	4.5	37,000	19,000	9.0	20,000	75	30,000	9,500
B195-T6	35,000	2.0	40,000	26,000	5.0	26,000	90	32,000	10,000
B195-T7	33,000	3.0	39,000	20,000	4.5	20,000	80	30,000	9,000
A214	22,000	2.5	27,000	16,000	7.0	17,000	60	22,000	.....
333-F	28,000	††	34,000	19,000	2.0	19,000	90	27,000	14,500
333-T5	30,000	††	34,000	25,000	1.0	25,000	100	27,000	12,000
333-T6	35,000	††	42,000	30,000	1.5	30,000	105	33,000	15,000
333-T7	31,000	††	37,000	28,000	2.0	28,000	90	28,000	12,000
355-T51	27,000	††	30,000	24,000	2.0	24,000	75	24,000	.....
355-T6	37,000	1.5	42,000	27,000	4.0	27,000	90	34,000	10,000
355-T62*	42,000	††	45,000	40,000	1.5	40,000	105	36,000	10,000
355-T7	36,000	††	40,000	30,000	2.0	30,000	85	30,000	10,000
355-T71	34,000	††	36,000	31,000	3.0	31,000	85	27,000	10,000
356-T6	33,000	3.0	40,000	27,000	5.0	27,000	90	32,000	13,000
356-T7	29,000	4.0	33,000	24,000	5.0	24,000	70	25,000	11,000
C612	28,000◈	7.0◈	35,000**	18,000**	8.0**	.....	70**	.....	.....
750-T5	18,000	8.0	20,000	8,500	10.0	8,500	45	13,000	9,000

* Tension and hardness values obtained from standard half-inch diameter tensile test specimens, individually cast in a permanent mold, and tested without machining off the surface. The modulus of elasticity varies somewhat with the alloy, but an average value of 10,300,000 psi can be used for most calculations.

† Results of test on specimens having an l/r ratio of 12.

†† Not required. The error in determining elongations of 1% or less is comparable with the value being measured.

* On standing at room temperature for several weeks, properties approach those of the T6 condition.

⊛ Less than 0.5 %.

◈ Based on tests made from 5 to 7 days after casting.

** From tests made approximately 30 days after casting.

ing as well as greater hardness and strength as compared to alloys of just aluminum and silicon. Corrosion resistance is better for these alloys than for the Al-Cu series but not as good as for the Al-Si series.

Al-Si casting alloys made of Al and up to 12% Si have excellent casting properties as based upon their high fluidity. Leak free castings are more readily made with these alloys, as are intricate castings of both thin and thick sections. In addition, Al-Si alloys are corrosion resistant. They are not as readily machinable as other alloy castings; are very abrasive to cutting tools.

Al-Mg casting alloys provide casting and welding properties poorer than the other alloys discussed, they are used because of their excellent combination of high corrosion and tarnish resistance and their very good mechanical properties. An alloy of 10% Mg as heat-treated has the greatest mechanical properties of all the castings made of alloyed aluminum.

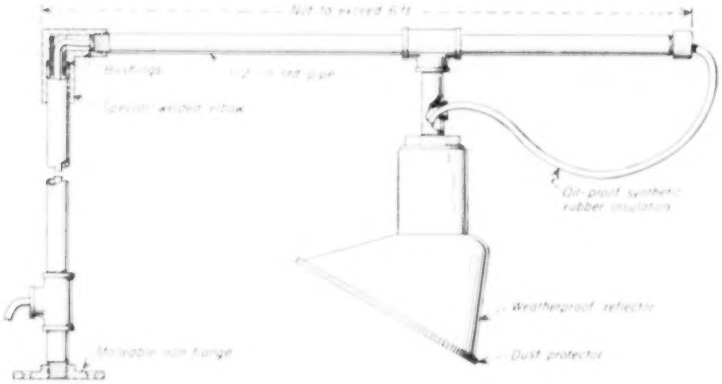
Al-Si-Mg casting alloys are used because of their good castability which includes pressure tightness, their corrosion resistance, strength, and their ability to be heat-treated. A variety of ductility and strength combinations can be attained by proper heat-treatment.

Al-Si-Ni-Mg casting alloys are used because of their excellent stability, wear resistance, low thermal expansion, and good high temperature strength. These characteristics are responsible for the use of these alloys as pistons in internal combustion engines.

Al-Cu-Ni-Mg casting alloys are about of the same castability as the Al-Mg alloys. However, they combine good strength at high temperatures, resistance to wear, and heat-treatability. Because of this, these alloys are used as cast air-cooled cylinder heads for aircraft engines.

Al-Zn cast alloys are not too readily castable and lose a lot of their ductility when heat-treated. At elevated temperatures they lose much of their strength; should not be used at temperatures over 200 F. They can be aged, either at room temperature or in boiling water. Interestingly, the aging of these alloys continues for almost a year.

Practical Ideas



Improved Machine Light Makes Operator's Job Easier

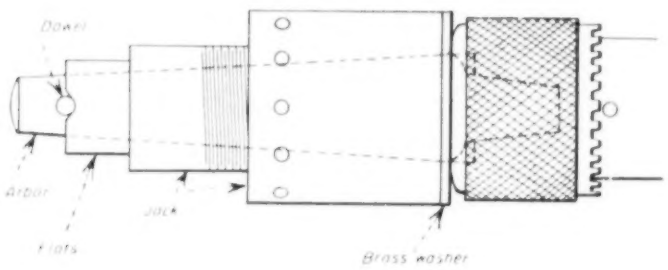
Easily constructed, the improved machine light shown has been made for a number of machine tools in the Central Shops at the Argonne National Laboratory. It has many advantages over the conventional machine light incorporating flexible conduit to permit adjustment of the reflector.

The concentrated light beam provided by the angular industrial reflector increases the illumination at the work surface, while preventing glare in the eyes of adjacent machine operators. Its wiring is supported above and away from splashing coolant and entangling chips, and the easy-to-clean reflector does not become hot enough to cause burns.

Designed for mounting on a fixed portion of the machine, the cantilever support permits adjustment of the light across the work area as desired by the operator. There is no need for it to move with the machine table, as in many lighting installations. Thus no flexible conduit need be used, eliminating breakage of the conduit which usually leads to short circuits.

Even with extreme vibration, this lamp will not "droop" and fall into a spinning chuck or other moving machine part, as so frequently happens with conventional machine lights. A glass dust protector cover can be used to keep the reflector clean in exceptionally dirty or wet locations.

The cantilever support is made from ½-in. standard pipe connected to a welded steel elbow designed for a slip-fit on the vertical support pipe. This permits the horizontal pipe arm to be swung over any portion of the working area. The reflector is suspended from a standard pipe tee drilled for a slip fit on the horizontal arm, making possible further adjustment of the reflector. No electric shocks are possible, since the heavy-duty two-conductor cable is protected by insulating bushings and grommets wherever it makes a turn in its supporting pipe. Also, the control switch for the light is located in the motor starter box, and is wired to turn the light on when the machine is running. *Alexander A Denst, Lemont, Ill*

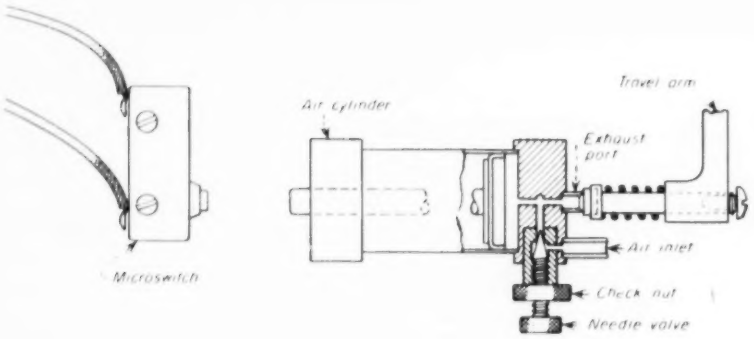


Jack Removes Arbors From Drill Chucks

A common operation in our maintenance department is removal of arbors from drill chucks. This was always a time-consuming job, and the men often marred or damaged the chucks when trying to remove the arbors with the usual hammer.

As a solution to this problem we have drilled a hole in the end of each arbor. This hole will take a dowel or pin. Then we made a set of tubular jacks, to pry the arbors loose. To do this work, a suitable jack is slipped over the arbor and the dowel is inserted into the hole at the end of the arbor. The jack is turned and easily forces the chuck off the arbor.

The inner half of the jack is recessed to fit the pin, and two flats on the end of the jack allow easy holding in a vise. A brass washer between the jack and the chuck body prevents marring the chuck body, which is usually not hardened. *H G Koslow, New York, NY*



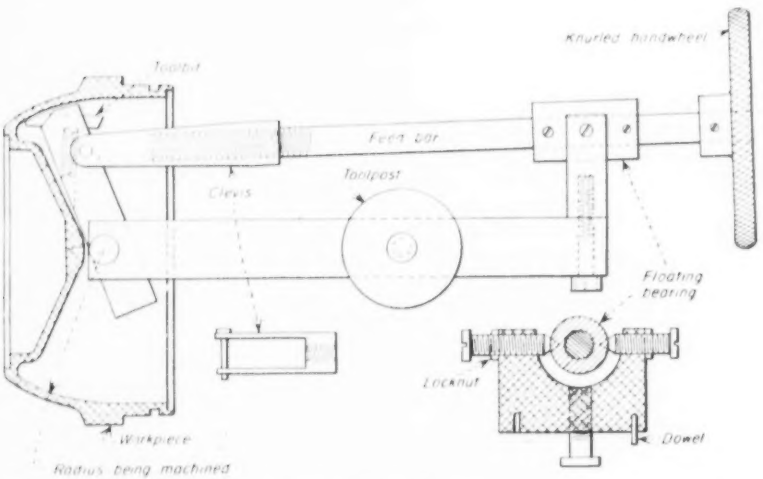
Common Air Clamp Adapts To Make Dwell-Timer

In the design of air-operated assembly machines, we had to have a dwell of from 1 to 10 seconds at the end of the work-stroke, to allow for variations in the length of the workpiece.

Electronic or pneumatic timers were not justified in this case, so we adapted a common single-acting air clamp (about 1 x 2 in.) to do the job.

The needle valve, valve housing, and check nut were assembled into the air inlet. The back of the cylinder was drilled as shown, so that, unless the travel arm is in contact with the composition pad for closing the exhaust port, the air entering the cylinder escapes through this exhaust port.

At the end of the work cycle, the travel arm, attached to the main cylinder ram, closes the exhaust port, and the entering air moves the piston toward, and into contact with, a MicroSwitch. The speed of this movement is adjustable, a needle valve providing the means of changing the piston-travel speed. *Archie Wilson, Trumbull, Conn*



Pivoted Tool Cuts Radius In Close Quarters

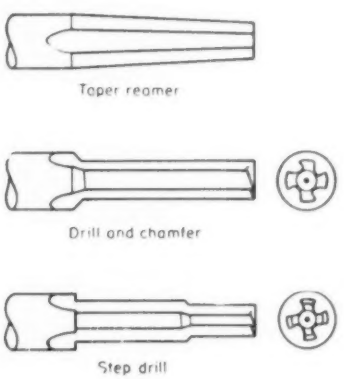
One job we had called for machining a radius at the base of a small aluminum cup, where dimensions were such that it would have been quite difficult to get a tool into the space allowed do the job.

Our solution was this pivoted tool, the holder of which fits within 0.021 in. of the base of the cup. The tool bar is CRS, $\frac{3}{8}$x1x$\frac{1}{4}$ in. The feed bar is $\frac{1}{4}$-in. round CRS with one end threaded for the actuating clevis which is pivoted on the tool-bit holder.

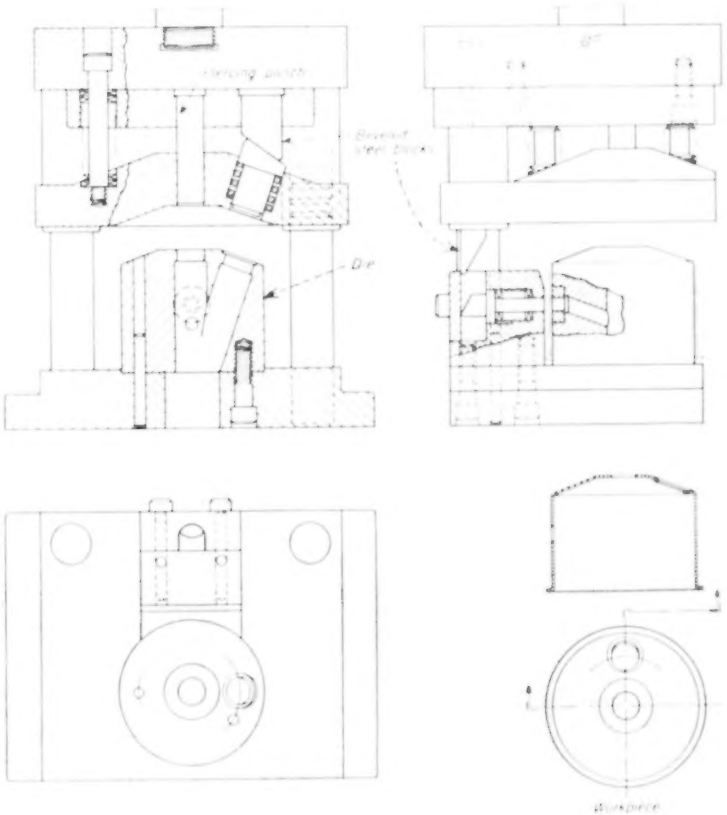
A knurled handwheel moves the tool smoothly in the required arc, and the radius is cut without longitudinal motion of the toolpost. A floating bearing permits the feed bar to swing when the tool moves along the radius. *Charles C Boston, Washington, DC*

Worn Out Taps For Odd Drilling Jobs

In our small job shop we frequently need cutters to produce stepped holes, tapered holes, or straight holes with a chamfer. Our regular practice was to machine these tools from hardened and ground high-speed steel. We now produce many



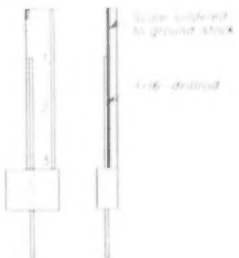
of these tools from dull high-speed taps. We rough-grind the tap on a bench grinder, mount it on centers, and finish grind and relieve the cutting edge. This saves us time formerly spent rough machining and heat-treating. *George H Koslow, Bronx, N Y*



Triple-Acting Punch and Die Does Three Jobs at Once

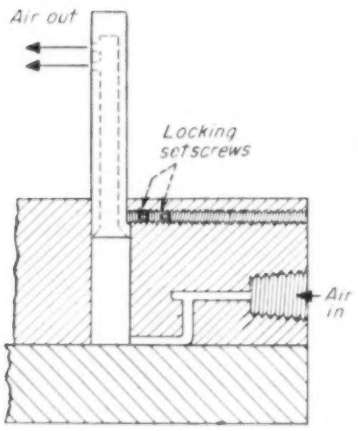
This triple-acting piercing and embossing punch and die is designed to pierce three holes in the sheet metal cup shown. One hole is pierced in the top of the cup at 90° to the horizontal plane. The second hole is pierced at a 20° angle to vertical, and embossed as shown. The third hole, in the side of the cup, is pierced horizontally.

When the pressram descends, the spring-actuated stripper plate and holder first come into contact with the cup, holding it firmly in place on the piercing die. The first piercing punch pierces the hole in the top of the cup, and as the ram continues downward, the beveled steel rod strikes the piercing punch which cuts and embosses the "20°" hole. At the same time, the hole in the side of the cup is pierced by the similarly actuated piercing punch which is held in the side of the punchholder plate. *Hjalmar Dahl, Upplands Vasby, Sweden*



Simple Depth Gage Checks Small Holes

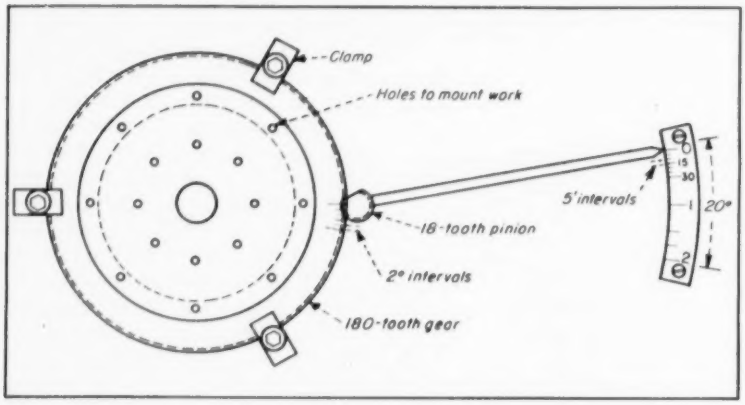
This depth gage can easily be made, to check depths of small holes to an accuracy of perhaps 0.010 in. The rod ends are ground square. *A J Smentkowski, Florissant, Mo*



Air "Snorkel" Ejects Die Work

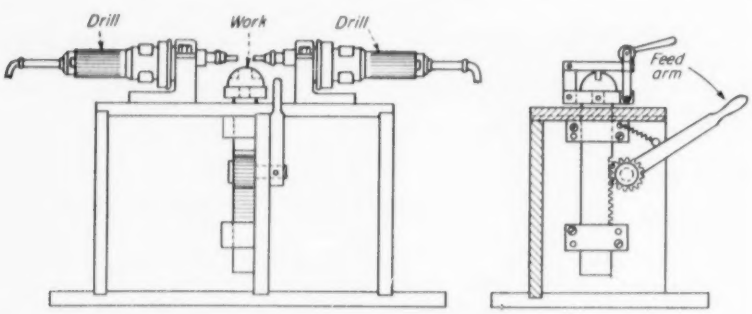
In designing and building dies, especially progressive dies, space limitations are always present, what with dowels, screws, cams, and slides, and it is sometimes difficult to find space for an airline to blow out the finished piece.

Here is an arrangement which we have used successfully in cases where space was limited. We call it a "snorkel" or periscope blower. It consists of a piece of drill rod with a central hole and one or more connecting holes through the side wall. A flat is milled on one side, extending to within $\frac{1}{8}$ in. of one end. This flat keeps the air blast pointed in the right direction and provides a stop to prevent the drill rod from being blown out of the hole. Two set-screws, locked together, ride against the flat. Air is brought in through the side or bottom. If the air is brought in from the side, as shown, the bottom of the pin is chamfered to reduce turbulence of the air as it enters the drill rod pin. *Henry George, Bronx, N Y*



Rotary Index Fixture Provides High Accuracy

This rotary indexing fixture was designed for engraving of dials with an engraving machine. It consists of a rack and pinion, with a 180-tooth gear centrally located on the fixture table, and an 18-tooth gear which meshes with the 180-tooth gear. A flat is milled off the 18-tooth gear to disengage this gear, so that the table can be rotated the required number of degrees, to the nearest multiple of 2. Then the pinion is engaged, and because of the 10:1 ratio of the two gears, a 20° movement of the small gear moves the table only 2°. *Russell S Wallace and Earl R Morrison, Baltimore, Md*



Inexpensive Milling Machine Does Two Slots in One Operation

This easily made, inexpensive milling machine consists of two electric drills fastened to a table, and mills two slots in one pass.

The workpiece is clamped to the table with an eccentric lock, and the rack and pinion lifts the work past the milling cutters, cutting both grooves at one pass. *Hjalmar Dahl, Upplands Vasby, Sweden*

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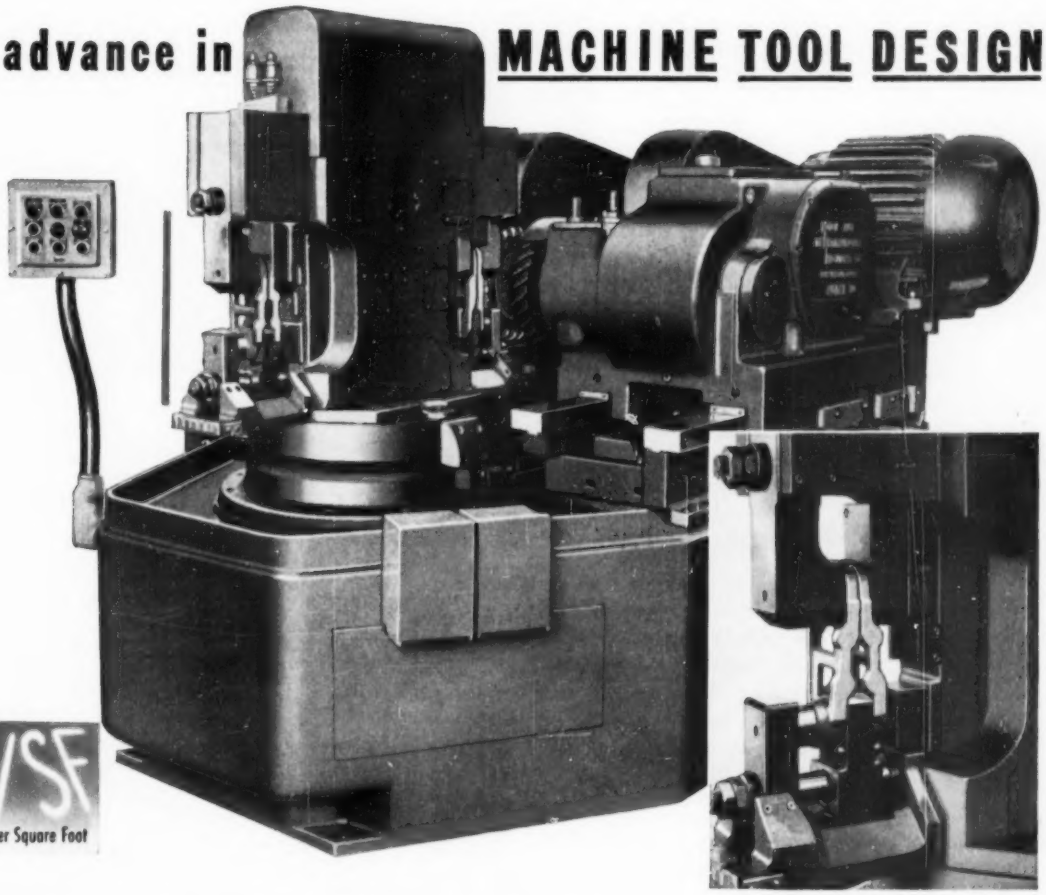
MOTCH & MERRYWEATHER Engineering for a

clear advance in MACHINE TOOL DESIGN



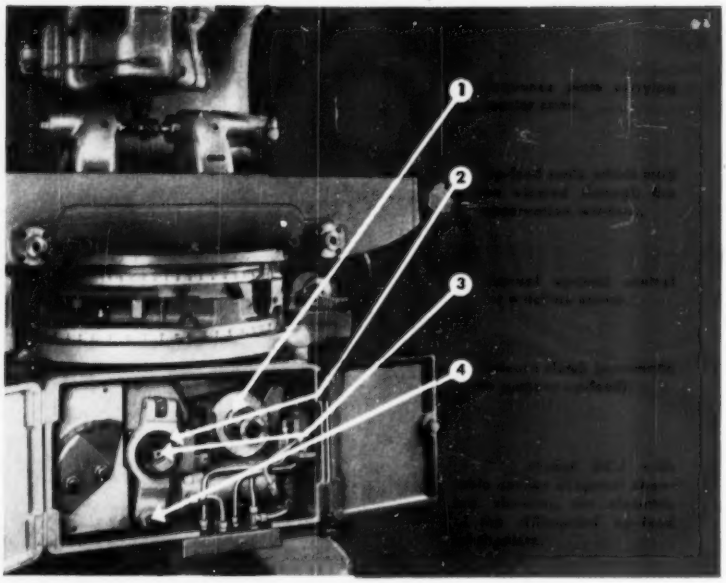
Each machine tool built by us is charged with doing a specific job better than before and for less. To us that is a privilege—a challenge—an obligation. Every machine developed by the Motch & Merryweather engineering staff must earn a permanent place for itself in Industry—must contribute permanently to a nation's advance in point of efficiency and economy—must mark a visible step forward in machine tool design and construction . . . An example is outlined on this page.

This M & M duplex production single-purpose milling machine mills two tractor side bars while two others are being loaded (removing at same station). Actually mills 70% of the time; up to 268 side bars per hour @ 100%. Two heads move, not the operator. Rigidity and power (30 h.p.) hike output. Fixtures to suit.

Manufactured by — THE MOTCH & MERRYWEATHER MACHINERY CO. —
CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Turning and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

GEAR SHAVING NOW *Much Faster and More Flexible*

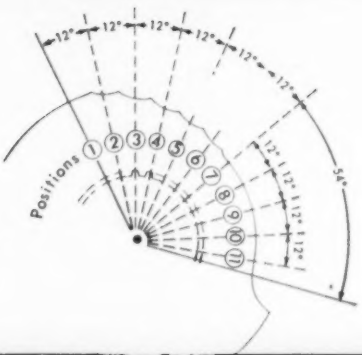


When Automatic Differential Up-feed and Conventional Crowning were added to the Red Ring Model GCU, shaving speed, flexibility and economy were all significantly increased.

AUTOMATIC DIFFERENTIAL UP-FEED

This efficient device provides for the first time an automatic cycle applicable to both diagonal and conventional shaving. This cycle is controlled by an eleven-position master cam. Included are backlash take-up, infeed cutting strokes, idling strokes and return to unloading backlash. The entire cycle or any portion of it may be used depending on job requirements.

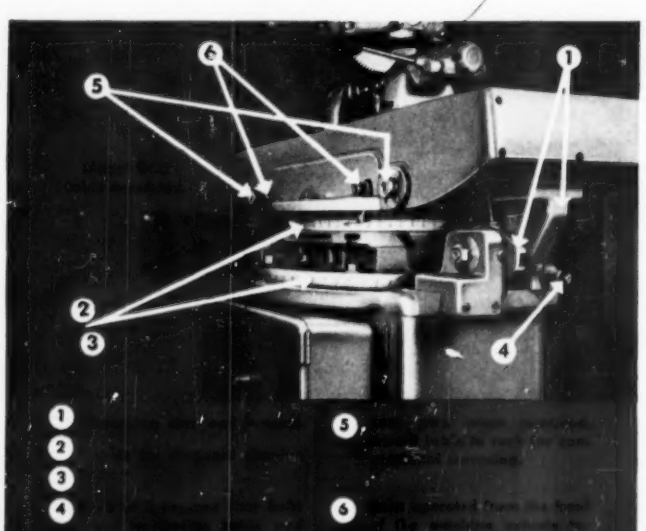
The cam itself does not actuate knee movement. It is strictly a stepped gaging device. Consequently every knee movement is positive, extremely precise and very fast. No danger of operator's errors. Perfect accessibility for fast loading and unloading.



One of the two control cams carried by the feed unit sequence plate.

CROWNING

Gears being shaved conventionally can be crowned by rocking the table about a central pivot during the automatic cycle. The cam controlling the rocking movement is located on table centerline to avoid any tendency to twist. This device also provides for taper shaving.



Write for Bulletin S53-7 for full details.

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

6585

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Computation of New Coordinates...I

By D E SWEET

Frequently the tool engineer must change the baseline of a tool or fixture. When this occurs, he must calculate new coordinates for the hole locations. The mathematics involved are tedious, and to save the tool engineer's time the accompanying tables have been developed.

The example below illustrates a typical use of the tables. The machined part, Fig 1, has two holes with coordinates A and B, and one corner is to be cut off at an angle. What are the values of new coordinates X and Y in the fixture, Fig 2, so that the part will be presented properly to the cutter in relation to the holes? The formulas, see Fig 3, are:

$$X = A \sin \theta - B \cos \theta$$
$$Y = A \cos \theta + B \sin \theta$$

In Fig 1, the cut-off angle is 30°, and the value of θ in the fixture, Fig 2, is 60.°

Suppose we compute coordinates X and Y for another example, where θ is 40°, A is ¾ and B is ¼.

Sin θ = 0.64279 and cos θ = 0.76604
Then X
= 0.75 × 0.64279 − 0.25 × 0.76604
= 0.48209 − 0.19151 = 0.29058

And Y

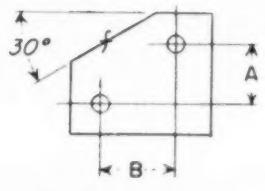
= 0.75 × 0.76604 + 0.25 × 0.64279
= 0.57453 + 0.016070 = 0.73523

The tables are worked out on the basis of fractions A or B from 1/64 to 1. Adjoining columns "X" and "Y" equal the fraction times the sine and cosine of the angle θ. Thus for A = ¾, "X" = 0.57453, and "Y" = 0.482088. For B = ¼, "X" = 0.19151 and "Y" = 0.160696.

To use the tables:

X = "Y" coordinate for A minus "X" coordinate for B = 0.48209 − 0.19151 = 0.29058.

Y = "X" coordinate for A plus "Y" coordinate for B = 0.57453 + 0.16097 = 0.73523



Machined part
FIG. 1

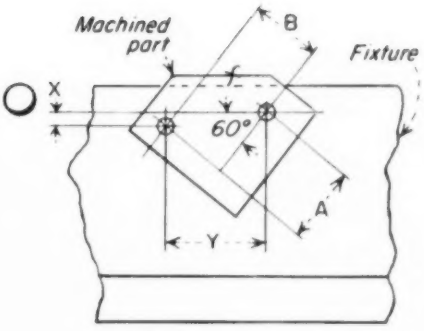


FIG. 2

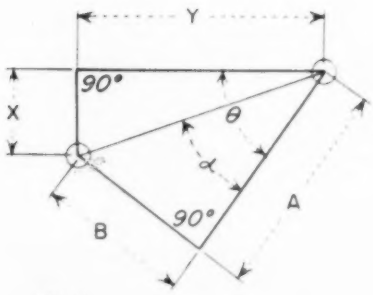


FIG. 3

5°

A or B	X	Y
1/64	0.015565	0.001362
1/32	0.031131	0.002724
3/64	0.046696	0.004086
1/16	0.062262	0.005448
5/64	0.077827	0.006809
3/32	0.093393	0.008171
7/64	0.108958	0.009533
1/8	0.124524	0.010895
9/64	0.140089	0.012257
5/32	0.155655	0.013619
11/64	0.171220	0.014981
3/16	0.186786	0.016343
13/64	0.202351	0.017704
7/32	0.217917	0.019066
15/64	0.233482	0.020428
1/4	0.249047	0.021790
17/64	0.264613	0.023152
9/32	0.280178	0.024514
19/64	0.295744	0.025876
5/16	0.311309	0.027238
21/64	0.326875	0.028599
11/32	0.342440	0.029961
23/64	0.358006	0.031323
3/8	0.373571	0.032685
25/64	0.389137	0.034047
13/32	0.404702	0.035409
27/64	0.420268	0.036771
7/16	0.435833	0.038133
29/64	0.451399	0.039494
15/32	0.466964	0.040856
31/64	0.482530	0.042218
1/2	0.498095	0.043580
33/64	0.513660	0.044942
17/32	0.529226	0.046304
35/64	0.544791	0.047666
9/16	0.560357	0.049028
37/64	0.575922	0.050389
19/32	0.591488	0.051751
39/64	0.607053	0.053113
5/8	0.622619	0.054475
41/64	0.638184	0.055837
21/32	0.653750	0.057199
43/64	0.669315	0.058561
11/16	0.684881	0.059923
45/64	0.700446	0.061284
23/32	0.716012	0.062646
47/64	0.731577	0.064008
3/4	0.747142	0.065370
49/64	0.762708	0.066732
25/32	0.778273	0.068094
51/64	0.793839	0.069456
13/16	0.809404	0.070818
53/64	0.824970	0.072179
27/32	0.840535	0.073541
55/64	0.856101	0.074903
7/8	0.871666	0.076265
57/64	0.887232	0.077627
29/32	0.902797	0.078989
59/64	0.918363	0.080351
15/16	0.933928	0.081713
61/64	0.949494	0.083074
31/32	0.965059	0.084436
63/64	0.980625	0.085798
1	0.996190	0.087160
	Y	X

85°

Wickman DIAMOND WHEELS

(RESINOID-BONDED & STEEL-BONDED)

for Free Cutting... Quality Grinding... Longer Life

WICKMAN resinoid-bonded diamond wheels are recommended for use where extremely fast, free cutting action is most important. They can be supplied in a full range of types and sizes.

WICKMAN-NEVEN steel-bonded diamond wheels are practically indestructible. Diamond particles stay in place until worn, thus eliminating expensive loss of unexpended diamonds. These steel-bonded wheels are noted for their long-life and the extra number of tools they grind.

WICKMAN steel-bonded chip breaker diamond wheels have an unusually long service life. They will cut standard depth chip breaker grooves in carbide tools *in a single pass.* 1½-2 minutes is required for average size tool.

All standard shapes, types, and sizes of Wickman diamond wheels are available. Regardless of your cutting or grinding operation, it will pay you to investigate their quality features.

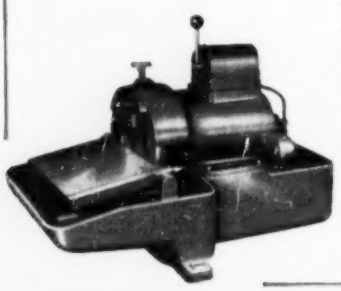
Wickman-Neven BENCH GRINDERS

for Maximum Efficiency

Wickman-Neven bench machines are designed especially for grinding and lapping carbide tools with steel-bonded diamond wheels. Both grinders feature built-in coolant pump and 1-HP full reversing motor in addition to many other advanced design features. You can be sure of highest efficiency and economical usage of diamond wheels with these bench machines that cut grinding costs.

OFF-HAND CARBIDE GRINDER

Model GJ-2 bench machine provides maximum convenience, accuracy and speed when sharpening either left- or right-hand tools. Angular table adjustments from 5° above to 15° below horizontal can be quickly made. Compactly built (16½" wide x 26½" deep x 16½" high) this sturdy grinder will give many years of heavy duty service.



UNIVERSAL TOOL & CUTTER GRINDER

Model GJ-3 has a swiveling motor head and a swivel table with vertical, longitudinal, and transverse movement. This fully universal tool and cutter grinder can be utilized for cutting off, chip breaker grinding, or general tool grinding. Standing 31¾" high, this grinder requires a 30" x 30" table area.

THE Wickman MANUFACTURING CO.

10325 CAPITAL AVENUE

OAK PARK (Detroit 37), MICH.

Computation of New Coordinates...II

10°			15°			20°			25°		
A or B	X	Y	A or B	X	Y	A or B	X	Y	A or B	X	Y
1/64	0.015388	0.002713	1/64	0.0150926	0.00404405	1/64	0.0146827	0.0053441	1/64	0.014161	0.006603
1/32	0.030775	0.005426	1/32	0.0301852	0.0080881	1/32	0.0293654	0.0106881	1/32	0.028322	0.013206
3/64	0.046163	0.008136	3/64	0.0452778	0.01213215	3/64	0.0440481	0.0160322	3/64	0.042483	0.019810
1/16	0.061551	0.010853	1/16	0.0603704	0.01611762	1/16	0.0587308	0.0213763	1/16	0.056644	0.026413
5/64	0.076938	0.013566	5/64	0.0754630	0.0202202	5/64	0.0734135	0.0267203	5/64	0.070805	0.033017
3/32	0.092326	0.016279	3/32	0.0905556	0.0242643	3/32	0.0880962	0.0320644	3/32	0.084966	0.039620
7/64	0.107713	0.018992	7/64	0.1056482	0.0283083	7/64	0.1027789	0.0374084	7/64	0.99127	0.046223
1/8	0.123101	0.021706	1/8	0.1207408	0.0323524	1/8	0.1174616	0.0427525	1/8	0.113288	0.052827
9/64	0.138489	0.024419	9/64	0.1358334	0.0363964	9/64	0.1321443	0.0480966	9/64	0.127449	0.059430
5/32	0.153876	0.027132	5/32	0.1509260	0.0404405	5/53	0.1468270	0.0534406	5/32	0.141610	0.066034
11/64	0.169264	0.029845	11/64	0.1660186	0.0444845	11/64	0.1615097	0.0587847	11/64	0.155771	0.072637
3/16	0.184652	0.032559	3/16	0.1811112	0.0485286	3/16	0.1761924	0.0641288	3/16	0.169932	0.079240
13/64	0.200039	0.035272	13/64	0.1962038	0.0525726	13/64	0.1908751	0.0694728	13/64	0.184093	0.085844
7/32	0.215427	0.037985	7/32	0.2112964	0.0566167	7/32	0.2055578	0.0748169	7/32	0.198254	0.092447
15/64	0.230815	0.040699	15/64	0.2263890	0.0606607	15/64	0.2202405	0.0801610	15/64	0.212415	0.099051
1/4	0.246202	0.043412	1/4	0.2414816	0.0647048	1/4	0.2349232	0.0855050	1/4	0.226576	0.105654
17/64	0.261590	0.046125	17/64	0.2565742	0.0687488	17/64	0.2496058	0.0908491	17/64	0.240737	0.112257
9/32	0.276978	0.048838	9/32	0.2716668	0.0727929	9/32	0.2642885	0.0961932	9/32	0.254898	0.118861
19/64	0.292365	0.051552	19/64	0.2867594	0.0768369	19/64	0.2789712	0.1015372	19/64	0.269059	0.125464
5/16	0.307753	0.054265	5/16	0.3018520	0.0808810	5/16	0.2936539	0.1068813	5/16	0.283220	0.132068
21/64	0.323141	0.056978	21/64	0.3169446	0.0849250	21/64	0.3083366	0.1122253	21/64	0.297381	0.138671
11/32	0.338528	0.059691	11/32	0.3320372	0.0889691	11/32	0.3230193	0.1175694	11/32	0.311542	0.145274
23/64	0.353916	0.062405	23/64	0.3471298	0.0930131	23/64	0.3377020	0.1229135	23/64	0.325703	0.151878
3/8	0.369304	0.065118	3/8	0.3622224	0.0970572	3/8	0.3525847	0.1282575	3/8	0.339864	0.158481
25/64	0.384691	0.067831	25/64	0.3773150	0.1011012	25/64	0.3670674	0.1336016	25/64	0.354025	0.165085
13/32	0.400079	0.070544	13/32	0.3924076	0.1051453	13/32	0.3817501	0.1389457	13/32	0.368186	0.171688
27/64	0.415467	0.073258	27/64	0.4075002	0.1091893	27/64	0.3964328	0.1442897	27/64	0.382347	0.178291
7/16	0.430854	0.075971	7/16	0.4225928	0.1132334	7/16	0.4111155	0.1496338	7/16	0.396508	0.184895
29/64	0.446242	0.078684	29/64	0.4376854	0.1172774	29/64	0.4257982	0.1549779	29/64	0.410669	0.191498
15/32	0.461630	0.081397	15/32	0.4527780	0.1213215	15/32	0.4404809	0.1603219	15/32	0.424830	0.198102
31/64	0.477017	0.084111	31/64	0.4678706	0.1253655	31/64	0.4551636	0.1656660	31/64	0.438991	0.204705
1/2	0.492405	0.086824	1/2	0.4829632	0.1294096	1/2	0.4698463	0.1710100	1/2	0.453152	0.211308
33/64	0.507793	0.089537	33/64	0.4980558	0.1334536	33/64	0.4845290	0.1763541	33/64	0.467313	0.217912
17/32	0.523180	0.092250	17/32	0.5131484	0.1374977	17/32	0.4992117	0.1816982	17/32	0.481474	0.224515
35/64	0.538568	0.094964	35/64	0.5282410	0.1415417	35/64	0.5138944	0.1870422	35/64	0.495635	0.231119
9/16	0.553956	0.097677	9/16	0.5433336	0.1455858	9/16	0.5285771	0.1923863	9/16	0.509796	0.237722
37/64	0.569343	0.100390	37/64	0.5584262	0.1496298	37/64	0.5432598	0.1977304	37/64	0.523957	0.244325
19/32	0.584731	0.103103	19/32	0.5735188	0.1536739	19/32	0.5579425	0.2030744	19/32	0.538118	0.250929
39/64	0.600118	0.105817	39/64	0.5886114	0.1577179	39/64	0.5726252	0.2084185	39/64	0.552279	0.257532
5/8	0.615506	0.108530	5/8	0.6037040	0.1617620	5/8	0.5873079	0.2137626	5/18	0.566440	0.264136
41/64	0.630894	0.111243	41/64	0.6187966	0.1658060	41/64	0.6019906	0.2191066	41/64	0.580601	0.270739
21/32	0.646281	0.113956	21/32	0.6338892	0.1698501	21/32	0.6166733	0.2244507	21/32	0.594762	0.277342
43/64	0.661669	0.116670	43/64	0.6489818	0.1738941	43/64	0.6313560	0.2297948	43/64	0.608923	0.283946
11/16	0.677057	0.119383	11/16	0.6640744	0.1779382	11/16	0.6460387	0.2351388	11/16	0.623084	0.290549
45/64	0.692444	0.122096	45/64	0.6791670	0.1819822	45/64	0.6607214	0.2404829	45/64	0.637245	0.297153
23/32	0.707832	0.124809	23/32	0.6942596	0.1860263	23/32	0.6754041	0.2458269	23/32	0.651406	0.303756
47/64	0.723220	0.127523	47/64	0.7093522	0.1900703	47/64	0.6900868	0.2511710	47/64	0.665567	0.310359
3/4	0.738607	0.130236	3/4	0.7244448	0.1941144	3/4	0.7047695	0.2565151	3/4	0.679728	0.316963
49/64	0.753995	0.132949	49/64	0.7395374	0.1981584	49/64	0.7194522	0.2618591	49/64	0.693889	0.323566
25/32	0.769383	0.135662	25/32	0.7546300	0.2022025	25/32	0.7341348	0.2672032	25/32	0.708050	0.330170
51/64	0.784770	0.138376	51/64	0.7697226	0.2062465	51/64	0.7488175	0.2725473	51/64	0.722211	0.336773
13/16	0.800158	0.141089	13/16	0.7848152	0.2102906	13/16	0.7635002	0.2778913	13/16	0.736372	0.343376
53/64	0.815546	0.143802	53/64	0.7999078	0.2143346	53/64	0.7781829	0.2832354	53/64	0.750533	0.349980
27/32	0.830933	0.146515	27/32	0.8150004	0.2183787	27/32	0.7928656	0.2885795	27/32	0.764694	0.356583
55/64	0.846321	0.149229	55/64	0.8300930	0.2224227	55/64	0.8075483	0.2939235	55/64	0.778855	0.363187
7/8	0.861709	0.151942	7/8	0.8451856	0.2264668	7/8	0.8222310	0.2992676	7/8	0.793016	0.369790
57/64	0.877096	0.154655	57/64	0.8602782	0.2305108	57/64	0.8369137	0.3046116	57/64	0.807177	0.376393
29/32	0.892484	0.157368	29/32	0.8753708	0.2345549	29/32	0.8515964	0.3099557	29/32	0.821338	0.382997
59/64	0.907872	0.160082	59/64	0.8904634	0.2385989	59/64	0.8662791	0.3152998	59/64	0.835499	0.389600
15/16	0.923259	0.162795	15/16	0.9055560	0.2426430	15/16	0.8809618	0.3206438	15/16	0.849660	0.396204
61/64	0.938647	0.165508	61/64	0.9206486	0.2466870	61/64	0.8956445	0.3259879	61/64	0.863821	0.402807
31/32	0.954035	0.168221	31/32	0.9357412	0.2507311	31/32	0.9103272	0.3313320	31/32	0.877982	0.409410
63/64	0.969422	0.170935	63/64	0.9508338	0.2547751	63/64	0.9250099	0.3366760	63/64	0.892143	0.416014
1	0.984810	0.173648	1	0.9659264	0.2588192	1	0.9396926	0.3420201	1	0.906304	0.422617
	Y	X		Y	X		Y	X		Y	X
	80°			75°			70°			65°	

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In just six months, these unique new straight cutting oils have "Job Proved" themselves as top performers in many metalworking shops all through the industry.

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AN AUTO PARTS MANUFACTURER INFORMS US, "Threaded parts are as much as 50° cooler when they come off the machines. And our operators like the clear, clean, odorless qualities of Sunicut 102-S."

SCREW MACHINE SHOPS REPORT, "The versatility of Sunicut 209-S permits us to reduce the number of oils we must stock."

BROWN & SHARPE SCREW MACHINE OPERATORS SAY, "Sunicut 11-S increases tool life, gives finer finishes, eliminates staining problem."

LARGE IMPLEMENT MANUFACTURER TELLS US, "We get better finishes in our broaching operations with Sunicut 110-S, and our operators favor its light color."

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INDUSTRIAL PRODUCTS DEPARTMENT
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Computation of New Coordinates...III

30°		
A or B	X	Y
1/64	0.013532	0.007812
1/32	0.027063	0.015625
3/64	0.040595	0.023437
1/16	0.054126	0.03125
5/64	0.067658	0.039062
3/32	0.081189	0.046875
7/64	0.094721	0.054687
1/8	0.108253	0.0625
9/64	0.121785	0.070312
5/32	0.135317	0.078125
11/64	0.148849	0.085938
3/16	0.162380	0.09375
13/64	0.175912	0.101562
7/32	0.189443	0.109375
15/64	0.202975	0.117187
1/4	0.216506	0.125
17/64	0.230038	0.132812
9/32	0.243569	0.140625
19/64	0.257101	0.148438
5/16	0.270633	0.15625
21/64	0.284165	0.164062
11/32	0.297696	0.171875
23/64	0.311228	0.179687
3/8	0.324760	0.1875
25/64	0.338292	0.195312
13/32	0.351823	0.203125
27/64	0.365355	0.210937
7/16	0.378886	0.21875
29/64	0.392418	0.226562
15/32	0.405949	0.234375
31/64	0.419481	0.242187
1/2	0.433013	0.250
33/64	0.446545	0.257812
17/32	0.460076	0.265625
35/64	0.473608	0.273437
9/16	0.487139	0.28125
37/64	0.500771	0.289062
19/32	0.514202	0.296875
39/64	0.527734	0.304687
5/8	0.541266	0.3125
41/64	0.554798	0.320312
21/32	0.568330	0.328125
43/64	0.581862	0.335937
11/16	0.595393	0.34375
45/64	0.608925	0.351562
23/32	0.622456	0.359375
47/64	0.635988	0.367187
3/4	0.649519	0.375
49/64	0.663051	0.382812
25/32	0.676582	0.390625
51/64	0.690114	0.398437
13/16	0.703646	0.40625
53/64	0.717178	0.414062
27/32	0.730709	0.421875
55/64	0.744241	0.429687
7/8	0.757773	0.4375
57/64	0.771305	0.445312
29/32	0.784836	0.453125
59/64	0.798368	0.460937
15/16	0.811899	0.46875
61/64	0.825431	0.476562
31/32	0.838962	0.484375
63/64	0.852494	0.492187
1	0.866025	0.500
	Y	X
	60°	

35°		
A or B	X	Y
1/64	0.012799	0.008962
1/32	0.025598	0.017924
3/64	0.038397	0.026886
1/16	0.051196	0.035848
5/64	0.063996	0.044810
3/32	0.076795	0.053772
7/64	0.089594	0.062734
1/8	0.102393	0.071696
9/64	0.115192	0.080658
5/32	0.127992	0.089621
11/64	0.140791	0.098583
3/16	0.153590	0.107545
13/64	0.166389	0.116507
7/32	0.179188	0.125469
15/64	0.191988	0.134431
1/4	0.204787	0.143393
17/64	0.217586	0.152355
9/32	0.230385	0.161317
19/64	0.243184	0.170279
5/16	0.255984	0.179242
21/64	0.268783	0.188204
11/32	0.281582	0.197166
23/64	0.294381	0.206128
3/8	0.307180	0.215090
25/64	0.319980	0.224052
13/32	0.332779	0.233014
27/64	0.345578	0.241976
7/16	0.358377	0.250938
29/64	0.371176	0.259900
15/32	0.383976	0.268863
31/64	0.396775	0.277825
1/2	0.409574	0.286787
33/64	0.422373	0.295749
17/32	0.435172	0.304711
35/64	0.447972	0.313673
9/16	0.460771	0.322635
37/64	0.473570	0.331597
19/32	0.486369	0.340559
39/64	0.499168	0.349521
5/8	0.511968	0.358484
41/64	0.524767	0.367446
21/32	0.537566	0.376408
43/64	0.550365	0.385370
11/16	0.563164	0.394332
45/64	0.575964	0.403294
23/32	0.588763	0.412256
47/64	0.601562	0.421218
3/4	0.614361	0.430180
49/64	0.627160	0.439142
25/32	0.639960	0.448105
51/64	0.652759	0.457067
13/16	0.665558	0.466029
53/64	0.678357	0.474991
27/32	0.691156	0.483953
55/64	0.703956	0.492915
7/8	0.716755	0.501877
57/64	0.729554	0.510839
29/32	0.742353	0.519801
59/64	0.755152	0.528763
15/16	0.767952	0.537726
61/64	0.780751	0.546688
31/32	0.793550	0.555650
63/64	0.806349	0.564612
1	0.819148	0.573574
	Y	X
	55°	

40°		
A or B	X	Y
1/64	0.011969	0.010043
1/32	0.023938	0.020087
3/64	0.035908	0.030130
1/16	0.047877	0.040174
5/64	0.059847	0.050217
3/32	0.071816	0.060261
7/64	0.083785	0.070304
1/8	0.095755	0.080348
9/64	0.107724	0.090391
5/32	0.119694	0.100435
11/64	0.131663	0.110478
3/16	0.143632	0.120522
13/64	0.155602	0.130565
7/32	0.167571	0.140609
15/64	0.179541	0.150652
1/4	0.191510	0.160696
17/64	0.203479	0.170739
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19/64	0.227418	0.190826
5/16	0.239388	0.200870
21/64	0.251357	0.210913
11/32	0.263326	0.220957
23/64	0.275296	0.231000
3/8	0.287265	0.241044
25/64	0.299235	0.251087
13/32	0.311204	0.261131
27/64	0.323173	0.271174
7/16	0.335143	0.281218
29/64	0.347112	0.291261
15/32	0.359082	0.301306
31/64	0.371051	0.311348
1/2	0.383020	0.321392
33/64	0.394990	0.331435
17/32	0.406959	0.341479
35/64	0.418929	0.351522
9/16	0.430898	0.361566
37/64	0.442867	0.371609
19/32	0.454837	0.381653
39/64	0.466806	0.391696
5/8	0.478776	0.401740
41/64	0.490745	0.411783
21/32	0.502714	0.421827
43/64	0.514684	0.431870
11/16	0.526653	0.441914
45/64	0.538623	0.451957
23/32	0.550592	0.462001
47/64	0.562561	0.472044
3/4	0.574531	0.482088
49/64	0.586500	0.492131
25/32	0.598470	0.502175
51/64	0.610439	0.512218
13/16	0.622408	0.522262
53/64	0.634378	0.532305
27/32	0.646347	0.542349
55/64	0.658317	0.552392
7/8	0.670286	0.562436
57/64	0.682255	0.572479
29/32	0.694225	0.582523
59/64	0.706194	0.592566
15/16	0.718164	0.602610
61/64	0.730133	0.612653
31/32	0.742102	0.622697
63/64	0.754072	0.632740
1	0.766041	0.642784
	Y	X
	50°	

45°	
A or B	X and Y
1/64	0.011049
1/32	0.022097
3/64	0.033146
1/16	0.044194
5/64	0.055243
3/32	0.066291
7/64	0.077340
1/8	0.088388
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9/16	0.397747
37/64	0.408796
19/32	0.419844
39/64	0.430893
5/8	0.441941
41/64	0.452990
21/32	0.464039
43/64	0.475088
11/16	0.486136
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23/32	0.508233
47/64	0.519281
3/4	0.530330
49/64	0.541378
25/32	0.552426
51/64	0.563476
13/16	0.574524
53/64	0.585573
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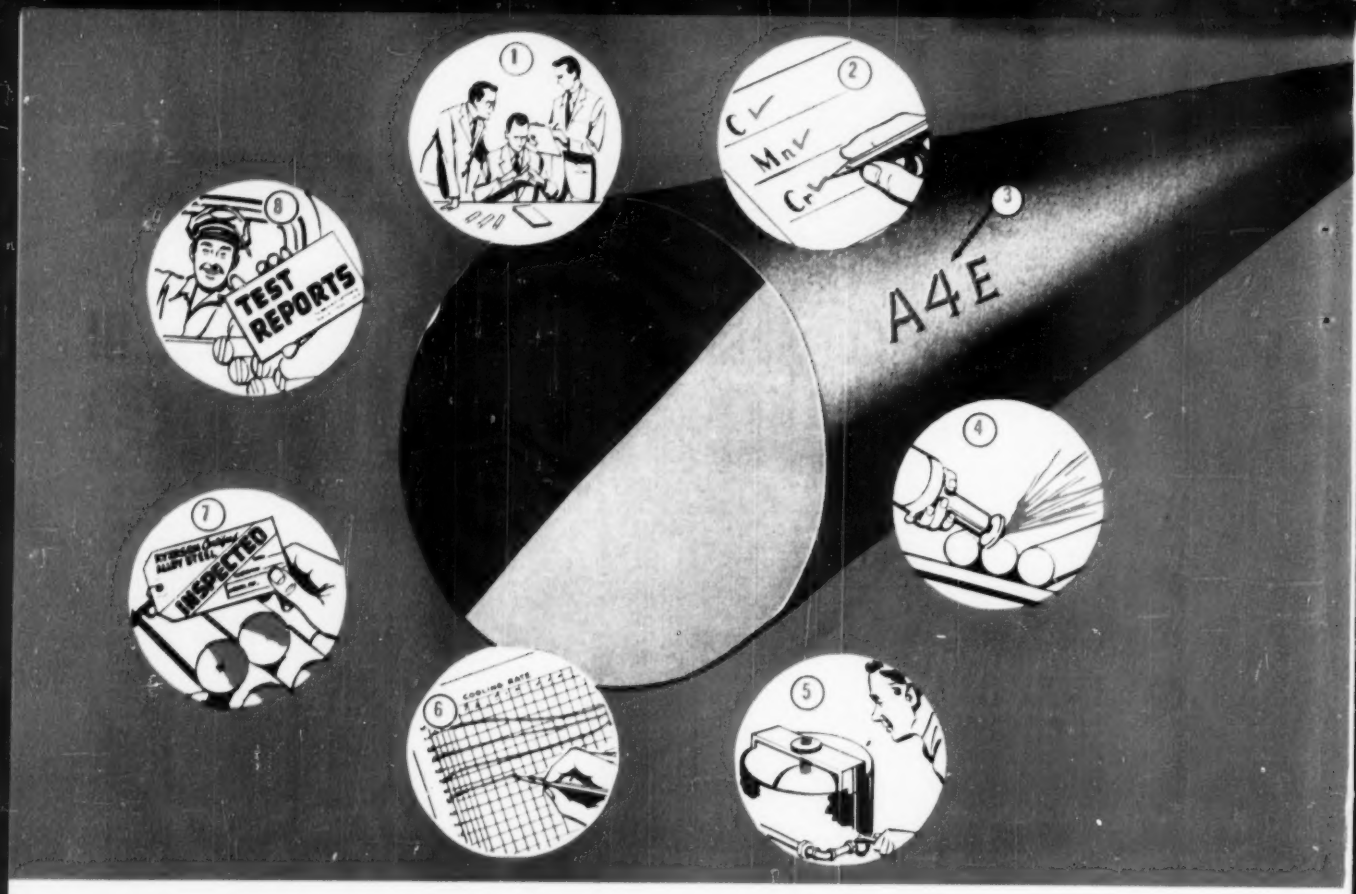
	X and Y
	45°



How Ryerson 8-step quality control

Protects Your Alloy Purchase

Are you sure of the alloy steel you buy? Sure of type and quality—sure of what the steel will do?

When you call Ryerson for alloys you can be sure—because Ryerson, and only Ryerson, takes eight separate and distinct steps to protect you against the many slips that can occur before the steel you order reaches your plant.

First, to assure you alloys of highest quality, we carefully select each heat to be carried in Ryerson stock [1] —verify the analysis as soon as a heat is received. [2] Next, for permanent identification, we stamp each bar with its particular heat symbol [3] —color mark it according to type. Then, to guard against mixed steels, we spark test every lift of bars from each heat. [4]

Meanwhile, we test a sample of every heat for hardenability [5] and interpret the test results for you. [6] So, finally, when you call Ryerson for alloys you can be sure. Tested steel--racked separately by heats—is prepared to your order; given a final inspection [7] and rushed to your plant. And with your steel (as-rolled or annealed), you receive complete test data [8] to verify quality and guide heat treatment.

This 8-point quality protection is yours at no extra cost. Just call your nearby Ryerson plant.

Principal Products: Carbon, Alloy & Stainless Steels—Bars, Structurals, Plates, Sheets, Tubing, Machinery & Tools, Etc.

RYERSON STEEL

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PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

TALKING SHOP

Hard Hat

FORD, at its Kansas City Aircraft Plant, has supplied all 1200 employees with safety helmets of laminated plastic. Huge double-decked jigs, for 67-ft wing halves of the B-47 *Stratojet*, are double-decked and present various head hazards; other tooling and equipment also presents "bump" or falling-object potential. So everybody—even riggers, cranemen, and visitors—must wear cap-type Skullgards. Several heads have already been saved.

Worker Plan

TWO YEARS AGO, C & O Railway officials invited employes to contribute to improved operation in an efficiency engineering program. Now a group of shopmen at the Huntington, W Va, repair shop have come up with a 225-sq ft model that shows how to rearrange the shop for diesel conditioning. The result of six weeks of intensive work by some 60 blacksmiths, metalsmiths, welders, and so on, it was built mostly on their own time. It would revise the 1928-built shop for about $2.5 million, instead of the $15 million for rebuilding, has been accepted by the board of directors, which has authorized $1½ million to be spent. It is expected to save $750,000 a year. Ernest Slack, supervisor who coordinated the job, says no letter or authorization was involved, and no red tape.

Knock on Every Door

IT HAS ALWAYS BEEN hard to make the shop men understand about the sales department because salesmen never seem to be busy, seem to have very flexible expense accounts and to be very generous with the company money the shop men try so hard to save. Monroe Calculating Machine Company has attacked the problem in its company magazine, "Keynote" in a four-page story titled, "Knock On Every Door." It shows how the salesman must walk in cold on tough prospects and must try to sell them the shop product. It shows in graphic pictures and captions how many of the common concepts of a salesman's easy life are wrong and how beating the pavements is not all it's cracked up to be. It points out that it is natural for a salesman to act enthusiastic and cheerful even when he may not be because such an appearance is essential in selling.

Halteres

A "VIBRATORY GYROSCOPE", which resembles a small tuning fork instead of the conventional spinning gyro wheel, has been developed by Sperry. It is based on the "halteres", or gyratory sense organs, of the common house fly. These club-shaped vibrating rods behind the fly's wings give him his sense of balance—and have for 200 million years. Sperry engineers studied slow - motion movies of insects in flight—now have the beginnings of a gyro that eliminates friction. And at last the common housefly proves of some use to man besides an irritant on an otherwise quiet summer afternoon.

No Gifts

ONE PRODUCER of formed and machined decorative objects of metal used to make gift items, but doesn't anymore. Business was good, and the cost and sales prices compared very favorably—on paper. But every order for 5000 pieces seemed to require that two or three times that number be made. While the 5000 went out of the shipping department, the rest went out the employee exits. Everybody in the place, from top executives to night watchman, figured that one or more "samples" was his by right.

Thermal Number

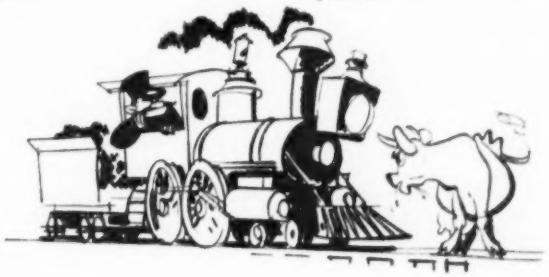
WHILE high temperatures are involved at the tool-chip interface, only a few Btu per sec need be removed to cool the area and minimize tool wear, according to Prof Ken Trigger, Univ of Ill. Flooding the area with a cooling liquid does very little beyond cooling the already-cut-away chip. This suggests that mist or spray cooling, providing greater coolant penetration, may be preferable. Prof Trigger obtains a "thermal number" by dividing the product of speed and feed by a constant, says tool wear is determined by the intense heat developed at the interface, that speed changes affect temperature much more than do feed changes, and when the radiused nose of a single-point tool is buried in the work, further increases in depth of cut do not affect interface temperature. Increasing the "thermal number", either by increasing speed or feed, increases the percentage of heat transferred to the chip, thus reducing heat distortion of the work and dimensional variation, but increasing tool wear. Thus economy dictates a compromise between rate of metal removal and time lost in tool changes.

Slick

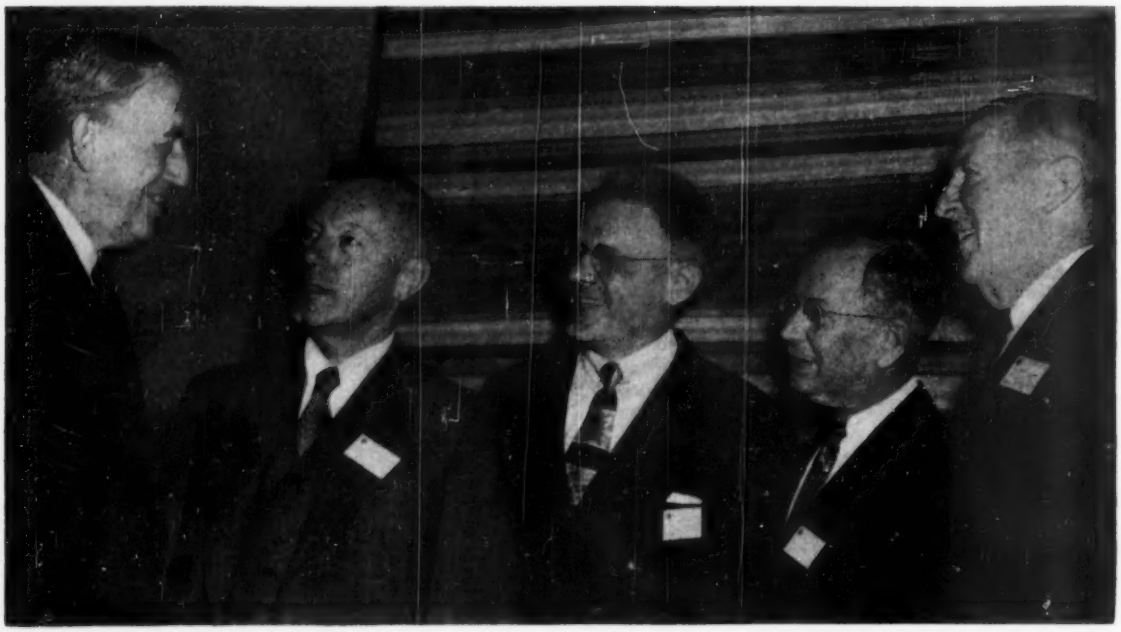
GEORGE GORTON MACHINE CO engineers, in redesigning the heavy-duty milling machine, used graphitic steel on saddle ways, cut elevating-power requirements 50%. The same steel has since been used at other points.

Track Law

BACK IN 1897, Dayton Coal & Iron Railroad laid down this law: "All trains will leave on time. No collisions allowed. Trains must stop before running over livestock. Drink nothing but cold water while on duty. Passenger conductors must wear shoes while on duty; socks not required."



News of Metalworking



FIRST NMTBA AWARD WINNERS for machine tool design and economic value contributions, honored at an ASME luncheon Dec 2 are congratulated by NMTBA President Herbert L Tigges (left) and NMTBA General Manager Tell Berna (far right). They are: (2nd left) Ernest Wildhaber, Gleason Works; (3rd left) Robert R Slaymaker, Case School of Applied Sciences; and (4th left) Carroll R Alden, EX-CELL-O Corp

ASME's Engineers Discuss Technology, Management Problems of the "Age of the Automatic Factory"

NEW YORK—The Age of the Automatic Factory is dawning. This was evident from the overflow attendances at technical sessions and symposia dealing with automation as more than 8000 engineers from all branches of industry gathered here for the 1953 Annual Meeting of the American Society of Mechanical Engineers, held here November 19-December 4.

Nine top experts on automation from such diverse fields as chemical processing, electrical engineering education; processing machinery, machine tool and pressed metals industries; electrical manufacturing and photographic equipment manufacturing discussed the technical, managerial and practical aspects of automation in a three-session symposium on "The Problems of Management in the Automatic Factory Age."

Speaking on "Economic Problems of the Automatic Factory", Everett M Hicks, manager and vice president, Grinding Machine Division, Norton Co, and vice president, National Machine Tool Builders' Association, urged firms planning to install automated equipment to give careful consideration to its economic aspects before doing so. As regards automation "some firms are trying to learn to run before learning to walk," he said.

Economics of Automation

"Automation decisions are basically economic," Mr Hicks said, "You must determine whether it will pay in your own plant. Each project must stand on its own feet."

Assuming a firm is about to purchase automated equipment, these are the prime factors to look for, Mr Hicks said: (1) how good is its design? (2) can the equipment be modified to take care of product design changes? (3) can your product be redesigned if necessary to facilitate automatic production? (4) is the automated equipment easy to maintain? (5) do you have or can you get a competent staff of maintenance men? (6) how much downtime will be required? and (7) *will automation pay?*

Other factors to consider when converting to automated production, according to Mr Hicks are: which system requires the least labor? the least floor space? the least power to run it?

J M Jurner and M B Millenson of American Machine & Foundry Co in their paper on "What Makes Automation Pay?" said that complete automation today is mainly restricted to large installations and comparatively static products, but partial automation is applicable to a wide variety of industries and products.

Engineers, Mr Millenson said, must be able to answer two questions to management: (1) will the company be able to maintain its product's position in a growingly competitive market? and (2) how much added investment will be needed to automate a plant?

Two factors must be balanced in automating a plant, Mr Millenson said—fixed charges and production costs. With automation, initial costs are high but unit costs are low. "You soon reach a point where automation is the most economical," he said.

Automation is easiest to justify

where it is economical even in the face of unchanging sales volume, Mr Millenson continued. Continuity of operation — uninterrupted flow of materials from station to station through a plant—is absolutely necessary in automation, therefore, he added, materials handling is a vital factor in redesigning any plant.

Here are the advantages of automation, according to Mr Millenson: (1) reduction in unit manufacturing costs, (2) less labor costs, plus ability to locate a plant away from major labor areas, (3) costs can be cut enough to warrant large increases in production, (4) increased good will toward the industry, (5) greater safety, and (6) automation is sometimes the only practical way to make some parts because of their size and precision.

In conclusion, Mr Millenson recommended that defense plants be automated "even if they are to be kept on a standby basis."

Job Shop Automation

Seth G Atwood, executive vice president, Atwood Vacuum Machine Co, speaking on "Planning and Facilities for a Job Shop," said that automation at all costs must be kept flexible, i.e, easily convertible to meet production demands. Mr Atwood cited the steps undertaken by his pressed metal product plant in installing automated equipment:

(1) a card system was set up with a card for every manufacturing segment of each part, (2) cards were then grouped by operational sequence, (3) a list was made of anticipated volume of production for each part, (4) average monthly production rate of a machine for each type of operation was determined, (5) total monthly volume of parts for each operation in each production line was divided by the monthly machine production rate for that particular operation. Thus the quotient is the number of machines required for each operation in each production line.

Management and Automation

At a later symposium session dealing with the "problems of management in the Automatic Factory Age," M L Hurni, consultant, General Electric Co, spoke on "Increasing the Opportunities for Automation," in which he outlined several ways in which management could decide whether or not to automate a plant, particularly in those fields where large volume and product variety are factors.

Charles E Knight, plant engineer, Plastics Division, Monsanto Chemical Co, speaking on "Management Organization with Automatic Production," said that automation may necessitate an entirely new chain of command and management concept within an organization. Mr Knight proposed the following managerial setup as one adequate to cope with problems arising from automating a plant: heads of plant production, marketing, personnel and operations research report to product executives (heads of manufacturing branches), who together with a research and product development director in turn report to the board of directors. While the truly automatic factory is not yet here, Mr Knight said, this is the time for unification of business management, systems engineering, computer theory and operations research under a management that can visualize "an entire factory in terms of its final product family and can gather specialists, who, working together, will create a structure of automation capable of complete end-point computer control."

Automatic Plant Supervision

George H Gustat, superintendent of Industrial Engineering, Eastman Kodak Co, in discussing "Problems of Administration and Supervision in the Automatic Factory," warned that lower costs and greater volume of production resulting from automation will depend on how "good and timely the judgment is that fosters the changes to automation." To accomplish the changeover to automaticity efficiently, here are some of things that must be done, according to Mr Gustat:

(1) better maintenance features must be incorporated into automatic machines, (2) personnel selection and training must be improved, (3) "the basic human urges for physical accomplishment must be provided for people on automatic operations, and (4) supervision must be improved.

TWICE HONORED at ASME's 1953 meeting was Philip M McKenna, president, Kennametal, Inc, who was awarded the Holley Medal and was chosen its 1953 Towne Lecturer

NMTBA Awards

One of the Metalworking highlights of the ASME meeting was its Honors Luncheon December 2; featuring presentation of the "machine tool design and economic value awards" made for the first time by the National Machine Tool Builders' Association for outstanding technical papers.

In explaining the reason why the NMTBA established these annual awards, Herbert L Tigges, executive vice president of Baker Brothers Inc and president of NMTBA, pointed out that "progress in the art of removing metal depends chiefly upon the time and effort expended by engineers in research and development work. . . . Upon work of this sort done by mechanical engineers today, will rest to no small extent the course of the machine tool industry tomorrow." Far more important, upon work of this sort will depend the nation's ability to continue to advance the American standard of living. Mr Tigges said that "to stay in business and to fulfill our function in the American scheme of things, we must constantly devise machine tools today that are better and more productive than the ones we built yesterday."

First award recipients were: Ernest Wildhaber, mechanical engineer, Gleason Works, for "Manufacture and Application of Gleason Toothed Face Couplings and Clutches"; Robert R Slaymaker, professor of Machine Design, Case Institute of Applied Sciences, for "Bearing Design Using Concentric Journal Theory"; and to Carroll R Alden, research engineer, EX-CELL-O Corp, for "Electrospark Machining."

Also honored at ASME's meeting, with the Society's Holley Medal for "a unique act of genius in research, development and applications of cemented carbide compositions for metal cutting," and selected to present this year's Towne Lecture was

Philip M McKenna, president of Kennametal, Inc, who spoke on "Economics and the Engineer" at a December 1 meeting.

"We mechanical engineers," Mr McKenna said, "have all had experiences where we can show that a machine will pay for itself in five years in shop costs, but when earnings from that machine are taxed 70%, the management must take into consideration that it will require 16 2/3 years to pay for the machine in 30-cent dollars retained after taxes. If it is likely that the dollar will buy only half as much after 16 2/3 years, one must reckon on 33 years to pay the value to replace the machine."

Aviation Luncheon

At the 50th Anniversary Luncheon honoring the Engineers' Contribution to Powered Flight, Igor Sikorsky summarized aircraft developments and predicted that we would read speeds of 2500 mph within the next five years. At the other extreme, perfection of the helicopter has made it possible to reduce air speed to zero.

Roy T Hurley, president of Curtiss-Wright, presided at the luncheon, and in introducing Sikorsky stated that industry is now reaching for aircraft engines with outputs as high as 100,000 hp.

Several sessions were held relating to the heavy-press program. Carl R Anderson, asst supt of the Lafayette extrusion plant, Aluminum Co of America, reported that delays in getting their 14,000-ton extrusion press into operation were the result of alignment problems in erection and wearing surface problems, all of which he reported as now under control. Dimensional variation from end to end of an extrusion may be greater on the larger extrusion but should be reduced when present extrusions are made in the larger press.

Design features of the 1500-ton stretching and detwisting machine for extrusions were outlined by Leo Hoffman, design engineer, Hydropress. The stretcher will handle extrusions up 115 ft in length with a cross section that will fit in a 32-in. circle.

Developments in tapered extrusions were described by H Albers, G Krause, and A Greensite, Loewy Construction Co. Among methods in the exploratory stage is one which produces three simultaneous extrusions tapered in the longitudinal direction through tapered recesses in a mandrel. Another produces a section of constant ID with tapered OD over a conical mandrel. Minimum wall is produced first over the large end of the mandrel. As the mandrel advances a wall of increasing thickness is produced, which must then advance over the large end of the mandrel to produce uniform ID.

Gas Turbines

At a November 30 session on gas turbine power, Russell R Mock and Norton B Jamieson of Wright Aeronautical Div, Curtiss-Wright Corp compared relative merits of turbojets, turboprops and piston engines for air transports in their paper on "The Future of the Turbo Compound Engine." This engine, the speakers said, in order to compete with turbojets and turboprops must improve its cruising powers and altitudes and achieve maximum power, fuel consumption and weight. This can be achieved in three ways: (1) more air flow to the cylinders, (2) improvement of basic engine efficiency and/or (3) a more efficient power recovery system.

Titanium Grinding

Lead-off paper in a December 3 session on metal processing dealt with "Fundamental Factors in the Machining and Grinding of Titanium." Authors E J Krabacher and M E Merchant of Cincinnati Milling Machine Co outlined combinations of three titanium properties that result in a high rate of tool wear and washing away of tools.

These are: (1) mutual solubility with other metals and refractories, (2) low thermal conductivity, and (3) high chip-flow velocity. All of these fundamental factors affect the difficulty of machining and grinding titanium, the authors said. However, they added, with a proper combination of grinding fluid and grinding wheel selection, titanium can be ground on a production basis.

Second paper in the session dealt with "The Theory of Regenerative Chatter in Precision Grinding Operations," in which Robert S Hahn of the Heald Machine Co analyzed regenerative chatter on the basis of instantaneous wheel depth of cut vs instantaneous dynamic force between wheel and work.

At a December 3 session on machine design, Frederick W Cunningham of Arma Corp led off with a talk on "Automatic Control — Present State of the Art," in which he told of recent applications of automatic controls to machine tools. Among those cited by Mr Cunningham were:

ASME PRESIDENT
Lewis K Sillcox
Honorary Vice-Chairman of Board
New York Air Brake Co

ASME REGIONAL VP
Prof William G McLean
Head, Dept of Mechanics
Lafayette College

ASME REGIONAL VP
Willis F Thompson
Vice President
Westcott & Mapes

(1) tape controls—with their great advantage of being kept on file so that when an order comes in for replacement parts, the tape is simply run through the machine again. Result: an exactly duplicated part. (2) Playback controls. (3) Computers and punch-card systems.

Perry L Nies of Ultrasonic Corp, speaking on "Principles of Feedback and Their Application in Machine Control," told of the relationship of static and dynamic accuracy, stability, damping, response time, phase shift and other characteristics. Feedback controls, Mr Nies said, can do much to overcome bad vibration, nonlinear loading, temperature and humidity changes, machine wear.

Computing Elements

Alvin Piatt of Librascope, Inc, described representative mechanical computing elements in his paper on "Mechanical Analog-Computing Elements and Their Application to Automatic Control." Mr Piatt told how mechanical computing elements can be adapted to computers, computing flow meters and a multi-element controller for a heat transfer process. He cited the applications of both the open-loop and closed-loop systems to production controls.

Speaking at a production engineering session on "Testing Methods for Production of Accurate Machine Slide Ways," George N Levesque of Brown & Sharpe Mfg Co dealt with production of cast-iron machine ways and straight edges. Among methods described by Mr Levesque were use of the autocollimating telescope for measuring surface accuracy, use of a moderately sensitive level with 0.0005-ipf graduations spaced about 1/10-in. apart; and determining flatness with a double-edged indicating straight rule.

At a December 3 session on metal processing, L V Coldwell and R E McKee of the University of Michigan discussed "Evaluation of Bandsaw Performance," in which they said recent tests reveal that bandsawing characteristics can be evaluated in much the same manner as other machining operations. The speaker said that careful selection and control of two important variables — cutting speed and feed rate or feeding force —is necessary and that recent tests on sawing of titanium show that positive power feed prevents breakdown of the band.

At a December 4 metal processing session, Carl J Oxford of National Twist Drill & Tool Co, speaking on the drilling of metals described use of a quick-stop technique to freeze the cutting action of a twist drill. Since his paper was a progress report on continuing research, Mr Oxford said, no firm conclusions have yet been drawn but he described developments in rake angle; effects of point angle, drill design and workpiece material; and operation of the split point for heavy web drills.

Final metal processing session on December 4, led off with "Cutter Life for Face-Milling Cast Iron," by W W Gilbert and O W Boston of the University of Michigan, and H J Siekman of Carboloy Dept, General Electric Co. The authors reported results of tests on face-milling different metals with cutters of various materials. Variables found in tool-life and power tests to evaluate capacities of sintered carbide, cast nonferrous metal and high-speed steel face-milling cutters showed these variables: grade of cast iron milled, tool material, feed, depth, width of bar, number of teeth, cutting speed.

Low-Cost Foreign-Made Steel Offered to US Warehouses

CLEVELAND — Foreign-made steel is being offered to warehouses here at prices below those of domestic-made steel. A New York metals brokerage firm is circularizing the Cleveland area with this letter:

"We can now quote you prices FOB railroad cars Youngstown or other points throughout the area, duty paid, which prices we believe will show you a substantial savings vs American mill prices. Also, we can give you quick delivery and by quick delivery we mean four to six weeks from Antwerp."

An official of The Steel Warehouse Association here claims the importers are laying the steel into Seaboard and Gulf Coast warehouses at from $20 to $40 per ton cheaper than domestic-made steel. And, he says, the importers are making every effort to get the steel into the area where domestic steel is made.

With warehouse customers now shopping for steel bargains, this could cause some price cutting that would not be justified insofar as domestic steels are concerned, the official predicted.

ASME REGIONAL VP
Prof Clifford H Shumaker
Director
Institute of Management

ASME REGIONAL VP
Vernon A Peterson
District Manager
Elliott Co

ASME REGIONAL VP
Thompson Chandler
Chemical Engineer
Carbide & Carbon Chemical Corp

Lake Erie Engineering Offers "Packaged Installations"

BUFFALO—"Packaged installations" of production equipment, set up in customers' plants ready to operate, are now being offered by Lake Erie Engineering Corp. The company will survey the customer's hydraulic press or die casting requirements and then will design, manufacture, supply and install all the basic machinery, tools and dies, conveyors, loading mechanisms, furnaces and other related auxiliaries. Lake Erie also will train the customer's supervisory and production personnel and will assume responsibility for satisfactory operation of the equipment as an integrated plant.

This plan, a consolidation of all the specialized services offered by Lake Erie Engineering, is designed to eliminate piecemeal purchasing and the resultant divided responsibility.

REPUBLIC STEEL FORMS NEW PRICING POLICY

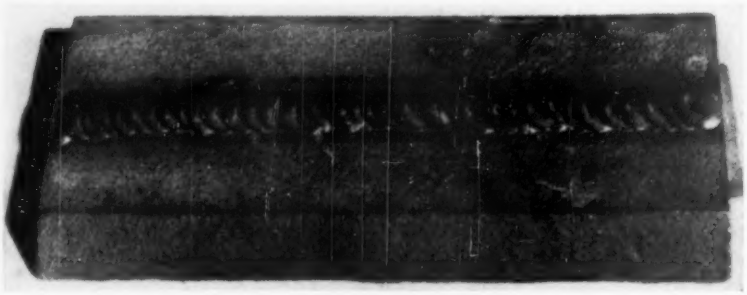
CLEVELAND—A new procedure for pricing its steel mill products was put into effect December 15 by Republic Steel Corp. The new pricing scheme at present applies only to hot rolled carbon steel bars, but later will be extended to other Republic steel mill products.

Cuts Red Tape

In a nutshell, Republic's new policy consists of selling and delivering steel mill products to any common carrier destination at a published delivered base price. In other words, all transportation costs will be included in Republic's delivered base prices—provided Republic can choose the method of transportation. Thus a customer can, if he wishes, pick up his own shipment at the mill, but he will receive no allowance for transportation. That's to alleviate the truck traffic problem at the mill's loading docks.

Advantages to the customer are: (1) he can tell from Republic catalogs which products are produced at each Republic mill, and which mill can deliver at the lowest price, and (2) he avoids all bookkeeping involved in handling transportation charges and damage claims.

Advantages to Republic: (1) salesmen can make on-the-spot delivered price quotations, (2) no need to calculate rail and truck rates for individual orders.



CAST-IRON WELD, said to be the first successful non-fusion weld on cold cast iron with electrode equipment, was on display at a recent three-day exposition featuring a new electrode, held at Eutectic Welding Alloys Corp's Flushing, NY, plant Dec 2-4. Other company products and a new welding film were also shown

Air Force Drops Single Prime Contractor Plan for Weapons Systems

WASHINGTON—The Air Force has abandoned attempts to have a single prime contractor do all the subcontracting for the "weapons system" that goes into a plane. This weapons system—electronic gear, motors, congressors and cables—contributes as much as 50% to the cost of a finished plane.

Early last summer, the Air Force indicated that it would soon shift to a single weapons system method of contracting wherever possible. For example, one contractor would be responsible for everything that went into a supersonic interceptor, except aerodynamic or ballistic components.

The Air Force's idea was based on the arguments of a number of manufacturers, who insisted that complex electronics and guidance systems had to be geared to everything else in the plane. For instance, the electronics equipment in some interceptors takes over flight control, searches out the enemy, flies an interceptor course and fires the guns.

Thus, a number of contractors held that inasmuch as electronics was the key to the entire system, they should have the final say on what types of hydraulic controls, automatic pilots, engine and navigation instruments, gun and bomb sights should be used. That way, a single contractor would have the job of putting the guts into a plane, without relying on other primes or other equipment furnished by the government.

Air Force procurement brass bought the idea. But only one such contract was let—to Convair for development of a bombing system for the intercontinental XB-58 long-range bomber.

Not long afterwards, a number of component manufacturers protested to Washington that the single systems method of contracting was likely to create defense contracting monopolies and do away with any government guarantees of competitive bidding. And, they said, procurement could also get out from under government supervision.

Component Makers to be Primes

The new policy switch isn't a complete flop-over from the mid-summer position taken by the Air Force—it's really a modification. Under its new procurement regulation AFR 70-9, the USAF will contract with a single prime to develop a complete weapons system. But instead of the component manufacturers dealing exclusively with the single weapons system contractor, they will enter into contracts as primes.

The systems contractor will establish and provide the performance specs for components and these will have to be approved by the Air Research and Development Command. After approval, the Air Force enters into a contract, buys the components and then furnishes them to the systems contractors as Government Furnished Equipment (GFE).

Along with this idea, the Air Force has already set up Weapons Systems Project offices at Wright-Patterson AFB, Ohio, to serve as a focal point for all military and contractor relations dealing with the development and production of a specific system.

AMTDA Launches Drive to Promote Faster Amortization of Equipment

NEW YORK—To attempt to convince members of Congress of the importance of enacting legislation at the next session to permit more rapid amortization of capital equipment for tax purposes, the American Machine Tool Distributors' Association is staging a series of meetings in various parts of the country to be attended by members of the association with local Congressmen as their guests.

Thomas Rudel, president of the Rudel Machinery Co Inc, New York, AMTDA national president and Ray Vidinghoff, president of Machinery Associates, Philadelphia, first vice president, are spearheading the campaign. Mr. Vidinghoff attended one of the regional meetings in San Francisco December 8 and another in Los Angeles the next day. Many other meetings, including one in Texas and another in New Orleans, have been set up.

In support of this drive, Rudel Machinery Co Inc is sending to its customers and other interested parties a one-page statement of the salient factors in favor of an immediate change in the government's amortization rules. This statement points out that:

Since the optional depreciation policy, when legalized, would apply only to machine tools purchased after the new law took effect, the Treasury would not suffer any substantial loss of revenue.

Government would collect more in taxes through increased profits of industrial concerns than it would lose through tax deduction because of more rapid amortization.

A large proportion of the machine tools installed in industry today are obsolete largely because manufacturers cannot afford to replace their equipment with amortization spread out over 20, 25 and 30 years.

The Rudel company urges that machine tool builders, distributors and users get word of the beneficial effects of quicker tax write-off to their Congressmen and Senators in person or by letter.

SHAEFFER PEN FORMS TOOL AND DIE DIVISION

FT MADISON, IOWA—Shaeffer Pen Co will house its new Tool and Die Division in a $1.5 million plant here. The new plant will produce tools, dies, fixtures and special machines for metalworking firms, as well as for the pen company. A A Zuber, formerly with Carver Pump Co, heads the new division, which employs 40 people.

The plant's equipment includes a 3-in. horizontal boring mill, a jig borer, a projecto form special grinder, a three-dimensional pantograph, complete heat treating equipment, a 72-in. shaper, a 30-in. comparator, a jig grinder, and a rotary head miller.

GLEASON COMPLETES HIGH-BAY ADDITION

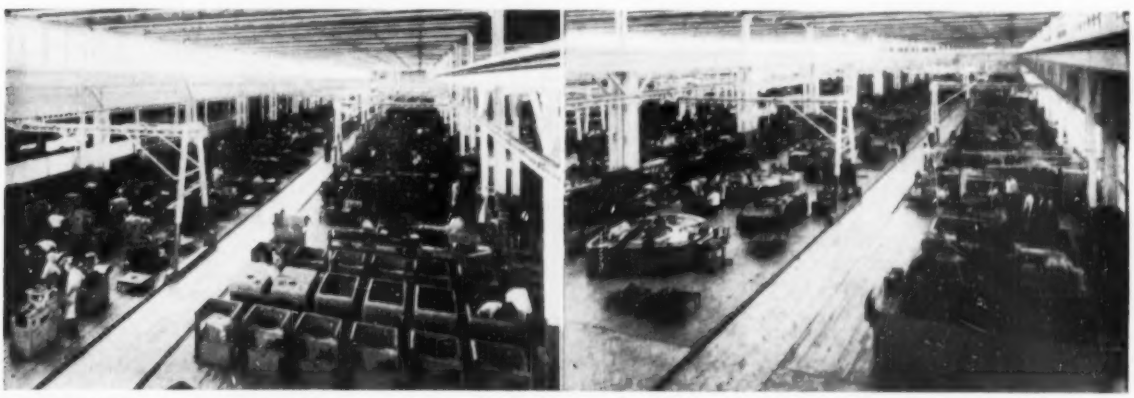
ROCHESTER, N Y — Gleason Works has completed a major high-bay plant addition for assembly, inspection and shipping. It is 120 ft wide by 592 ft long, in two bays, with an 80 x 48-ft, 2-story unit on the front to match the earlier facade. The front section has a new kitchen on the second floor for the plant cafeteria, and the lower floor is devoted to electrical assembly.

In the inspection area, a unique underfloor oil storage system has been installed. Hydraulic, lubricating, and cutting oils are all pumped from tanks to test-area outlets, and drained through filters back to them, eliminating the usual trucking of oil. Also, the shipping area is designed so both railway cars and trucks can be loaded simultaneously under cover, and at floor height. The platform projects at the far end to parallel the railroad spur for a car length, while truck roadways are between track and platform at the near end.

CONE AUTOMATICS TO BE MADE IN ENGLAND

WINDSOR, VT—Cone Automatic Machine Co of Great Britain has been formed to make and sell Cone Automatics in England and on the Continent, Henry P Chaplin, president of Cone Automatic Machine Co has announced.

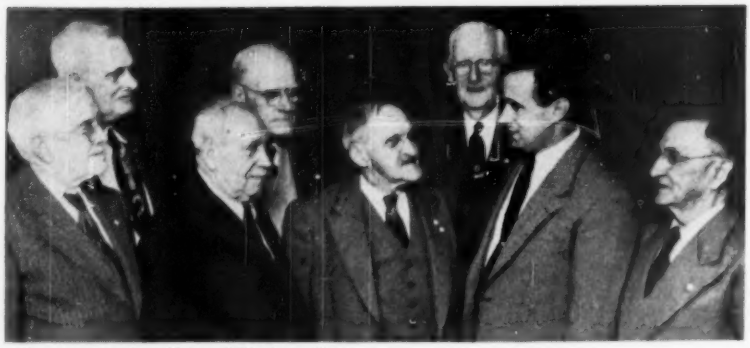
Headquarters will be in Birmingham, England, with Louis Carter as managing director. Mr Carter was associated with the Charles Churchill Co for 29 years. The Churchill-Redmond Co will build Cone machines for the new company.



INNER (LEFT) AND OUTER BAYS of new Gleason addition provide assembly, inspection and shipping areas totalling almost 80,000 sq ft; have customary wood floors except for concrete in large-machine assembly area and down-draft painting grills, both in outer bay. Aisle flooring is laid in chevron-pattern parquet. Note 25 single-leg electric gantries under 30-ton overhead crane. Piped test oils avoid oil carts and reduce spillage. Machines are inspected after assembly, again after painting during a "green" run on customer's job.

HARRIS-SEYBOLD BUYS PRINTING MACHINERY FIRM

WESTERLY, CONN—Harris-Seybold Co, Cleveland, has purchased C B Cottrell & Sons Co, 99-year-old local manufacturers of letter-press printing equipment. Cottrell's plant here employs about 700 workers, plus 200 more at its Milwaukee plant. Acquisition of Cottrell by H-S marks the greatest realignment of printing equipment manufacturers in 25 years and puts Harris-Seybold in the forefront of printing machinery manufacturers. Reason behind the acquistion is to prepare the ground for "typeless typesetting," an electronic process now in development by Harris-Seybold.



(Photo courtesy Providence (RI) Journal)

RETIRED MACHINE TOOL VETERANS HONORED by Brown & Sharpe Mfg Co at a recent luncheon are shown with company president Henry D Sharpe, Jr (second from right). Left to right: Harry R Mason, 50 years with the company; John Stirling, 50 years; Francesco D'Antuono, 50 years; John A Jennings, 50 years; Archibald J Griffith, 70 years; Nicholas F Cain, 60 years; and Leon W Jillson, 50 years. Service includes time on the job plus retirement on pension

Screw Machine Products Industry Looks to Seasonal Auto Pickup, New Markets to Reverse Downtrend

CLEVELAND—Although the screw machine products industry is currently experiencing cutbacks in new orders, member firms of the National Screw Machine Products Association, meeting here for a two-day Services Clinic Dec 7-8, expect a business upturn in January, when automotive orders pick up after the fall slack season. In some areas, automotive orders account for 40% of the screw machine product business, notably in such automotive areas as Detroit and northern Indiana.

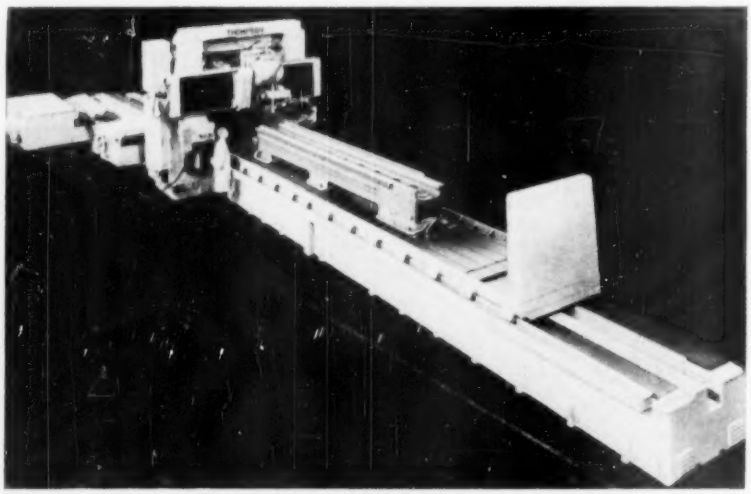
The screw machine products business started to decline last April and in some quarters predictions are that it will continue to slide off through at least mid-1955. Percentage-wise, this crystal balling stacks up this way: 1952's estimated industry-wide profit before taxes was 12.8%; for 1953, this is predicted to fall off to 11.8%; and for 1954 to a low, low 8%. These predictions are based on an NSMPA report dated July 30. But NSMPA is now conducting a new member-wide survey to find out if anticipated conditions have changed.

NSMPA's member companies are in the main small shops and elimination of the Excess Profits Tax won't help them much.

In recent months, new orders and new order inquiries have dropped off sharply. NSMPA attributes this to three basic causes: (1) sharp cut in defense orders following the shooting war's end in Korea, (2) reduced farm income and consequent drop in farm equipment sales, and (3) reduced consumer demand for home appliances.

Screw machine products inventories today are 20-30% higher than what current backlog demands. And it is predicted that the current downtrend could result in a 20% loss in produced hours and a cutback in the industry's direct labor force of 20%, and in indirect labor force (plant maintenance, etc.) of almost as much.

But the screw machine products industry's future isn't by any means as dark as it might seem. T Laurence Strimple, secretary of National Acme Co, manufacturer of screw machines says the industry has "barely scratched the surface" of the aviation and electronics industries. For one thing, National Acme is experimenting with new techniques and equipment for machining titanium alloy screw machine products for jet aircraft engines. And when the bugs are ironed out, National Acme will pass the results on to its regular screw machine customers.



WORLD'S LARGEST SURFACE GRINDER, recently installed at Monarch Machine Tool Co, Sidney, Ohio, and built by Thompson Grinder Co, is designed to finish "V" and flat bedways on lathes to within 0.0005-in. tolerances. Machine weighs 110 tons, is 79-ft long, 13-ft high and 13½-ft wide. Four 30-hp electric motors each drive 50 gpm hydraulic pumps. Two grinding wheels can be operated at once

William H Spence

Earl P Leeds

James Meehan

A J Snyder

Names in the News

William H Spence has been appointed assistant to the vice president, sales, Brown & Sharpe Manufacturing Co, Providence, RI. **Earl P Leeds** is new general sales director, domestic machine tool sales, and **James Meehan,** sales director, will head domestic milling and grinding machine sales.

Philip E Spindell has been named vice president, engineering, and **Paul Mueller,** vice president, manufacturing of Template Reproduction & Engineering Co, Philadelphia. Mr Spindell, who joined TRECO early this year as chief engineer, was previously associated with Piasecki Helicopter Corp; Mr Mueller has been associated with the company for the past eight years in sales and manufacturing capacities.

G S Williamson has been elected vice president, manufacturing, of the AiResearch Manufacturing Div, Garrett Corp, Los Angeles. He has been associated with the company since 1941, most recently as works manager for the Los Angeles and Phoenix plants.

Matthew J Betley has been appointed vice president and general manager of Aeroquip Corp, Jackson, Mich. Mr Betley joined the firm in 1952 and was named vice president, manufacturing, last February.

Otto W Winter, president of the Winter Engineering Co, Buffalo, has been named to head the new Shell Mold Div of Pettibone Mulliken's Beardsley & Pipe Div, Chicago, marketing a new line of automatic and semi-automatic equipment.

Fred Mackey, vice president in charge of manufacturing for A O Smith Corp, has returned to Milwaukee headquarters to assume larger responsibilities in administration of manufacturing problems. For the past year he has been located at the Landing Gear Div at Toledo, Ohio, directing defense goods production, and has divided his time between that plant and the Airframe Div at Rochester, NY. **Arnold J Ristow,** who has been managing the Rochester unit, will join Mr Mackey's staff; **Willard L France** succeeds him as works manager.

A J Snyder has been appointed sales manager of the cutting tool sales division of Motch & Merryweather Machinery Co, Cleveland. Formerly vice president and general manager of Morse Twist Drill Co of New Bedford, Mass, Mr Snyder recently served the government in the capacity of chief of the cutting tool section of National Production Authority's Metalworking Equipment Div. Mr Snyder will direct the distribution of cutting tools throughout the M&M territory, with offices in Cleveland, Detroit, Pittsburgh, and Cincinnati.

Grant S Diamond, president of Electro Refractories & Abrasives Corp, Buffalo, has been elected vice president of the Grinding Wheel Institute of Cleveland.

OBITUARIES

F J Lapointe, 68, founder of the American Broach & Machine Co, Ann Arbor, and the Acme Broach Corp, Milan, Mich, died Nov 29. Following his resignation from American Broach in 1946, Mr Lapointe formed Acme Broach Corp, where he was active as chairman of the board and executive vice president until his illness last August.

J Walter Jeffrey, 73, former vice president of Jeffrey Manufacturing Co, Columbus, Ohio, died Nov 21. Mr Jeffrey who had been ill since April, was a director of the firm, although he had not been active in the company for the past ten years.

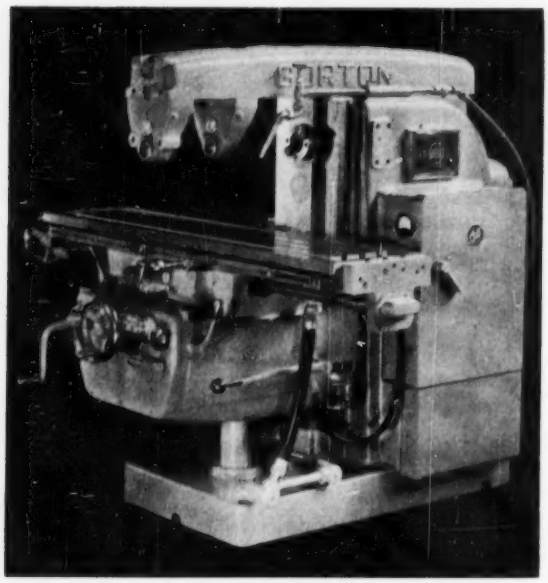
Robert Malcom, Sr, 82, chairman of the board of Chicago Eye Shield Co, died at Elmwood Park, Ill, Nov 27. Mr Malcolm founded the company in 1903 and patented many safety equipment items during his lifetime; he was actively engaged in business at the time of his death.

A Donnally Armitage, 81, chairman of the board of J H Williams & Co, Buffalo, died Dec 2. Mr Armitage joined the organization in 1921 as vice president, became president in 1942, and ten years later, chairman of the board.

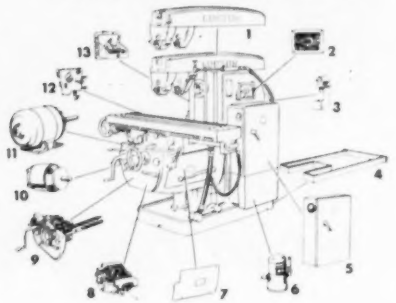
Joseph Fitzgerald, associated with the Metalworking Equipment Division of the Business and Defense Services Agency, Department of Commerce, died Dec 2. He was well known throughout the machine tool industry. He had served in the War Production Board during World War II and in the Securities Resources Board prior to the Korean war. He was one of the mainstays of the Metalworking Equipment Division of the National Production Authority from its beginning.

Christian Baldenhofer, president of the Thompson Grinder Co, Springfield, Ohio, died Nov 23.

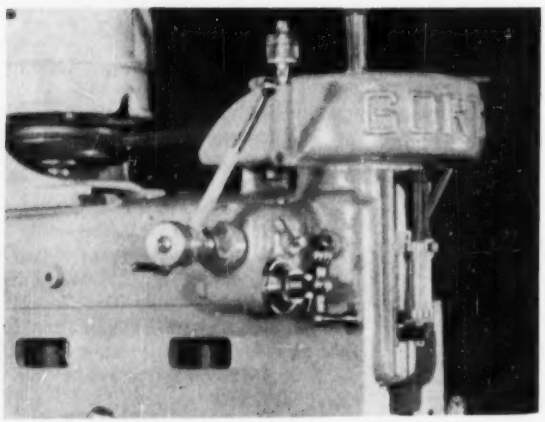
New Shop Equipment

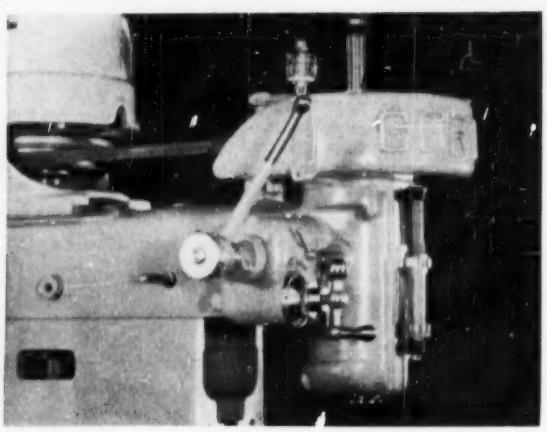


GORTON UNIT CONSTRUCTION

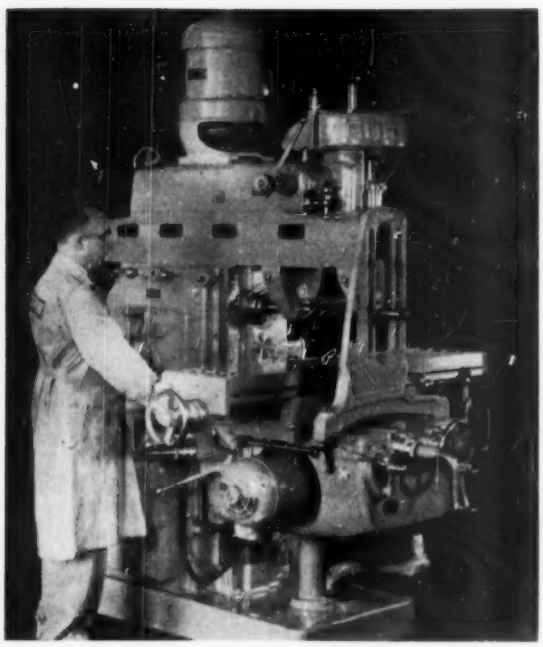


1 Ram, easily removed for installation of special rams or attachments.
2 Removable breather port cover plate for easy adjustment of spindle bearing.
3 Zero speed switch for braking spindle.
4 Exclusive, removable coolant pan.
5 Main control box with built-in spindle horsepower load meter.
6 Motorized coolant pump assembly.
7 Knee service cover plate providing access to rapid traverse clutch, rapid traverse switches, start-stop-brake switch, and oil pump.
8 Knee feed box.
9 Front knee cover and feed distribution assembly.
10 Standard NEMA frame knee motor, permanently lubricated.
11 Standard foot mounted spindle motor, permanently lubricated.
12 Rear controls assembly.
13 Spindle speed box.





Gorton Mills Provide Dual Milling Ability



Materials and Parts

George Gorton universal milling machines are designed with interchangeable components that provide ease of adjustment and maintenance as well as make it possible to attach a high-speed vertical milling head which gives the machine dual milling ability.

There are two basic machines in the line, the 2-28 and the 3-34. They have similar ratings and features with the exception of the following: model 3-34 has a working surface of 14x62 in. and longitudinal feed of 34 in.; model 2-28 has a working surface of 12⅜x56 in. and longitudinal feed of 28 in.

Basic machine 3-32 is pictured at the upper left and alongside it is a diagram showing the unit-construction features. The smaller pictures show the mill equipped with receptor ram on which is mounted the standard 9-J high-speed vertical milling head, retracted and extended. In the lower right picture, the vertical head has been retracted into the ram and the ram extended and equipped with arbor support base for slab milling.

With this dual setup, face and slab milling can be done with the vertical head retracted, or the head can be extended for high-speed vertical milling, die and mold duplicating, or profiling.

According to the manufacturer, these universal machines can be used for plain milling with assurance that no creeping or other movement of the swivel block will occur. In the plain milling position the swivel block is locked in place with four ⅝-in. bolts and four ¾-in. bolts. Clamping and bearing spread is 28 in.

The machine is said to offer the same rigidity when used as a universal. The Gorton swivel block is the full size of the saddle and provides a positive bearing spread of 26 in. even at a 45° angle. Two curved clamping sections hold the swivel block. A concealed coolant-return channel is incorporated in the swivel block and saddle.

Another important feature of the basic machine is the full-width knee of 24½ in. The knee is almost as wide as the saddle is long. This feature reportedly assures maximum rigidity under heavy cutting loads by providing support to the workpiece closely approaching that of a bed-type machine.

Other features include a simplified gear train, an extra-long saddle with integral cross-rib construction, coolant pump and motor concealed in the column base removable coolant pan, and a horsepower meter for safeguard against overload.

George Gorton Machine Co, Racine, Wis

TABLE	Knee Bearing Surface Width	24½"
	Working Surface and Overall Size	14" x 62"
	Swivels Left or Right up to 47° (Universal Model)	Yes
	Swivel Block Bearing Surface (Universal Model)	300 Sq. In.
	T-Slots — Number and Size	Three — 11/16"
	Distance Between T-Slots	2¾"
CAPACITY	Vertical Feed (under power, 18¼")	18¼"
	Longitudinal Feed	34"
	Cross Feed	12"
SPINDLE	Alloy Steel, Hardened and Ground, Precision Bearings	Yes
	No. 50 National Standard Taper — 3½" per Foot	Yes
	Diameter of Nose	5-1/16"
	Size of Hole Through	1⅛"
SPINDLE SPEEDS	Number — In Approximate Geometrical Progression	18
	†High Range	50-2000 R.P.M.
	†Medium Range	28-1100 R.P.M.
	†Dual Range (36 speeds)	25-2000 R.P.M.
	Reversible	Yes
FEEDS	Number — In Approximate Geometrical Progression	16
	High Range — Longitudinal and Cross (Rate per Minute)	¼"-60"
	Vertical (Rate per Minute)	⅛"-30"
	Low Range — Longitudinal and Cross (Rate per Minute)	½"-40"
	Vertical (Rate per Minute)	¼"-20"
RAPID TRAVERSE	High Feed Range — Longitudinal and Cross (Rate per Minute)	150"
	Vertical (Rate per Minute)	75"
	Low Feed Range — Longitudinal and Cross (Rate per Minute)	100"
	Vertical (Rate per Minute)	50"
DRIVE MOTORS	Spindle — Rated Horsepower (High Speed Range)	10
	(Medium Speed Range)	7½
	(Dual Range)	10/5
	Feed — High Range Rapid Traverse (Rated Horsepower)	5
	Low Range Rapid Traverse (Rated Horsepower)	2
	Coolant Pump — Rated Horsepower	¼

... INCLUDING

Gear analyzer setup allows visual inspection of magnified gear image as it rotates in contact with composite rack ..... page 148

Semiautomatic multiple - wheel grinder handles parts having multiple diameters in a single automatic plunge-grind cycle page 149

Surface - measuring instrument permits separation of waviness and roughness characteristics page 150

Electronic inspection setup for rocket shells produces paper trace—uses no photographic film page 152

Drilling machines with V-belt drive feature three speed ranges to max speed of 12,000 rpm page 154

Plain and universal shapers made in utility and heavy-duty models with choice of three stroke lengths page 156

Vacuum metallizing units have 30-in.-dia chamber and normal production rate of four cycles per hour ..... page 158

Automatic turret lathe allows operator to select feeds and speeds during manual cycle, then proceed with pushbutton operation page 160

... and in Jan 4

Drilling and tapping machines with vertical-motor cone-pulley drive have three or four speed ranges and variable number of spindles.

Carbide tool grinder incorporates three-pulley-drive abrasive belt for finishing and 6-in. wheel for roughing.

Tiny Light Generator for Inspection in Confined Areas

DoAll has added a 2-in. monochromatic light generator, for inspection of flatness, finish, and size with optical flats, to its 5- and 20-in. units.

Because of its size (base is 7 in. long x 3½ in. wide), the new Monolight is particularly adaptable for use at production machines, inspection stations, and by roving inspectors. It permits on-the-job checks on the chuck of a surface grinder, or on the surface of laps. Adequate magnetic shielding of lightweight aluminum permits inspection on magnetic chucks when power is on.

In use, the head is rotated to the rear so that it is directly over the work surface; work is placed under the head in back of the instrument. Head is rotatable a full 360° around the column.

DoAll Co, Des Plaines, Ill

Cutoff Wheel

BFR reinforced, resinoid, hub-type cutoff wheel has been improved to increase life of up to a third more than its predecessor, producing the same quality of cut. Wheel is available in 7 and 9-in. dia, with ⅞-in. hole size.

Norton Co, Worcester 6, Mass.

Shear-Speed Gear-Shaper Attachments Save Time

Two devices for cutting production time are now available on the Shear-Speed gear-shaper line. One is a pneumatic holding mechanism built into the head of the shaper to allow for automatic positioning of the gear blank and for clamping it in place during the shaping operation. The other is a manually controlled hydraulic device which ejects the gear blank after the shaping operation is completed.

The pneumatic device uses only plant air. Cup-shaped sleeve adapters are fitted into a tapered hole in the bottom of the air cylinder piston. These adapters fit over the top of the arbor when working on a hole gear, or over the end of the gear shaft, and move down to bear against the upper face of the gear.

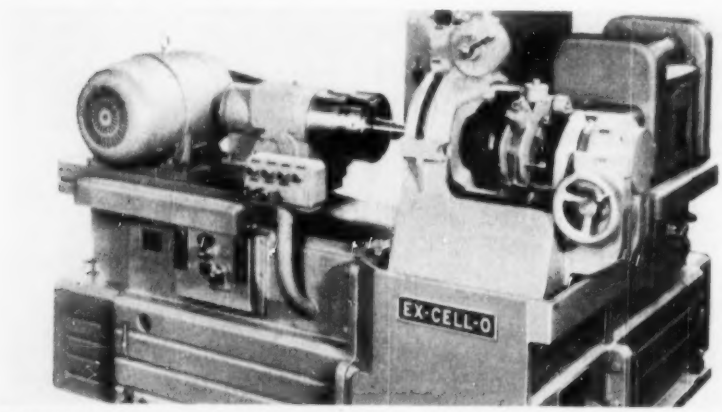
The hydraulic ejector cylinder is mounted integrally with the reciprocating vertical ram which carries the work arbor. An adapter attached to the hydraulic piston is raised against the lower face of the gear to eject it.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich

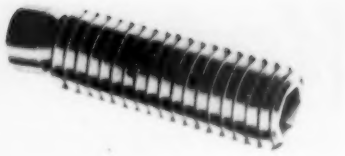
Metal-Cutting Saws

Summit metal-cutting tools including slitting, screw-slotting, small circular, side-chip, and staggered-tooth saws, made in Sheffield, England, are now available in this country. Tools are made of high tungsten steel; said to outperform ordinary high-speed steel saws by producing more work at faster speeds with longer life.

Imported by L H Chappel & Co, 1137 Post Rd, Fairfield, Conn



REFRIGERATION COMPRESSOR BLOCK cylinders and crank bearing diameters are bored simultaneously on this two-way precision boring machine with way units joined to center section at 90° angle. The angle is held within 0.001 in. in 14 in. Table of one way unit supports a single spindle having tools to machine the crankshaft bearing diameters. The other way unit supports the spindles that bore the cylinders — *Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich*

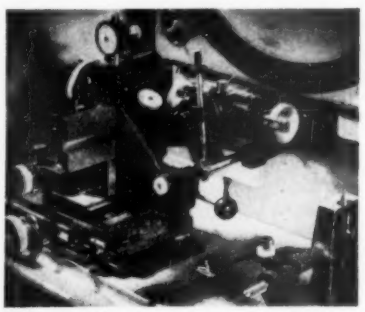


Screw-Ball Clamp

Vlier has introduced a self-aligning rest pad for jig and fixture work. The device uses ball-bearing construction and the threaded portion is machined from heat-treated alloy steel.

Advantages claimed are: eliminates marring which occurs when an ordinary holding pad is not at 90° to clamped surface; clamp automatically adjust itself to distribute uniform pressure; steel ball provides low-friction surface for rotation and oscillation; and the hex-socket end allows full use of screw length. Standard hex key is all that is needed for making pressure adjustment.

Vlier Engineering, Inc, 4552 Beverly Blvd, Los Angeles 4, Calif



Gear Analysis By Optical Gaging

With this gear analyzer, developed by Optical Gaging Products, direct observation of a magnified gear image allows inspection, analysis, and gaging of gears under simulated operating conditions.

The gear is viewed as it rotates in contact with—and at the correct center distance from—a composite rack chart (diametral pitch, 14 to 180). The image is projected on a Model 3 Kodak Contour Projector.

This setup allows checking: involute profile, fillet interference, OD, root diameter, pitch diameter, backlash (by center-distance and "slap-between-teeth"), circular pitch, modified tooth forms, tapered teeth, tooth crowning, first and last contact points, as well as asymmetrical teeth.

Optical Gaging Products, Inc, 26 Forbes St, Rochester 11, NY

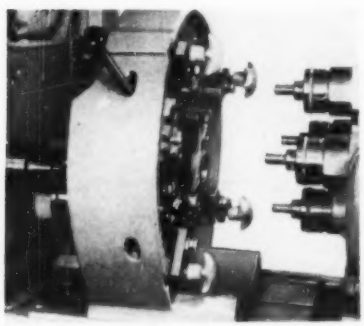
Sel-Rex Plating Equipment Uses "Jet" Agitation

Mass-production or pilot-plant plating of precious metals can be accomplished with this portable equipment. It was designed to use the Sel-Rex Bright Gold process and Bright Silver Sol-U-Salt bath.

Equipment consists of: Sel-Rex selenium rectifier with automatic timer; stainless steel tank which can be used as anode; movable work rack which will accommodate a portable plating barrel; corrosion-resistant stainless-steel filter; drip-proof pump powered with ½-hp motor; and safety tank to catch leakage.

Agitation is accomplished with a "jet" arrangement at bottom of tank. This produces continuous agitation of the solution without mechanical motion. Solution is continuously filtered and pumped back into the tank under pressure. Available standard models have capacities of 10, 20, or 30 gallons.

Sel-Rex Precious Metals, Inc, 229 Main St, Belleville 9, NJ



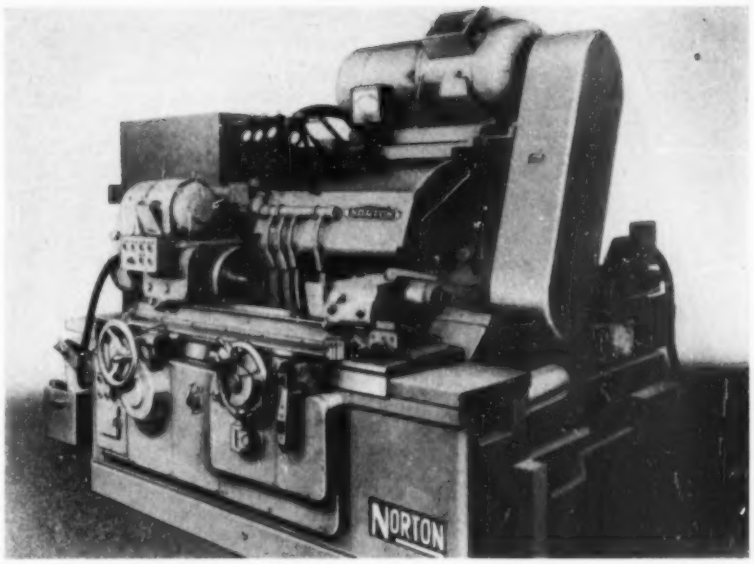
Double-End Machine Tooled To Bore 7 Holes in 1 Cycle

This standard style 17 Ex-Cell-O machine finish-bores seven holes in one operating cycle. The part is a magnesium supercharger; production rate is 27 parts per hour. Bore diameters are held to ±0.0005 in. and relative location to ±0.001 in.

The 18-in.-dia part is located radially by a dowel hole. The machined OD is centralized in a cam-type chuck, then four clamping fingers pull the finished face of the part against a locating surface on the chuck.

An individual spindle and a two-spindle cluster at the left end-finish three holes and four individual spindles at the right end-finish the remaining four holes.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich



Semiautomatic Norton Machine Grinds Multiple-Diameter Parts

Type CM-1 heavy-duty semiautomatic multi-wheel grinder was designed for grinding parts having multiple diameters in a single automatic plunge-grind cycle. This cycle includes work and coolant control, rapid wheelhead advance, grinding feed, dwell, and rapid return. The cycle operation occurs under electrically timed control, but a selector switch for optional manual control is provided.

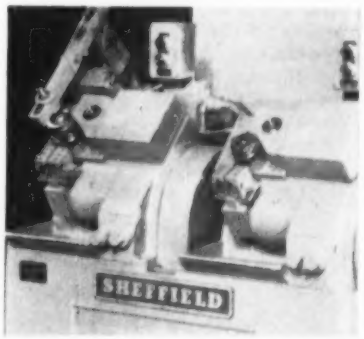
The wheel spindle has a body diameter of 12 in. and is supported at each end in cartridge-type bearings. Multiple wheels, 36 in. in dia, are carried on the spindle body between bearings to a maximum over-all span of 30 in., including spacing collars. The wheelhead moves on widely spaced 74-in.-long way.

Grinding wheel changes are facilitated by the cartridge-type bearings which support the wheel spindle. The wheel spindle and bearings are removed as a unit. Wheel change is also made easier by a mechanical device which swings back the combined wheel guard and wheel-drive motor mount.

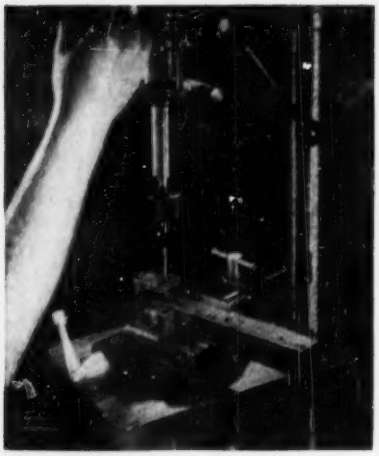
A hydraulically operated wheel-truing device is mounted on the wheel slide at the rear of the wheel guard and consists of individual truing units for each wheel. A diamond in each truing head is preset to a master gage and truing of all wheels is done simultaneously. The entire operation is automatic and is initiated by the operator or may be arranged to operate at predetermined intervals.

The machine has been designed to permit automation arrangements when desired.

Norton Co, Worcester 6, Mass



GEAR BURRING MACHINES (series 380) for aircraft gears have a time cycle as low as 0.2 sec per tooth on some models. Gears up to 24 in., internal or external, are handled on one or more of these eight machines. Fast changeover is said to make them highly suitable for burring small-lot quantities. Model illustrated is 380-C for burring external spur or helical gears to 7-in. OD. It features two cutterheads, two workstations, and interchangeable plate-type tooling. Cutter action is designed to burr individual teeth in cluster gear work as well as separate gears. Production rate is 400 to 600 teeth per min—*The Sheffield Corp, Dayton 1, Ohio*



Instant-Change Safety Vise Features Fast Rachet Jaw

Instant-change safety vise was designed for fast setups on production pieces and features ratchet jaw termed lightning-fast.

Model has three bosses for easy jig attachment. Any number of holes can be drilled without removing work because the vise turns over on three different sides for maximum drilling flexibility.

Vise locks securely by ¼-turn of T-handle at any table position, thus making it drill jig when duplicate pieces are required. Work is locked or released by flick of hinged handle which operates screw jaw. Choice may be made of 9- or 12-in. jaw opening. Can be used for end drilling and centering, and angle drilling,.

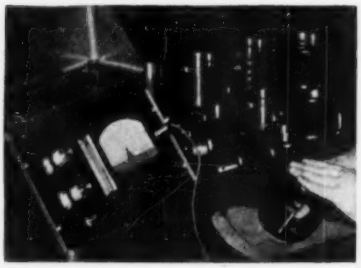
Wahlstrom Float-Lock Sales Dept, American Machine & Foundry Co, 511 Fifth Ave, New York 17, NY

Ease of Coupling Feature of V-Belt

Veelos adjustable V-belt for D and E drives is said to be the easiest to couple and uncouple. The link belts are made of plys of specially treated high-tensile-strength canvas duck, joined by riveted studs with removable cup washers and T-screws. This construction is said to give greater strength and durability at all key points and yet enable the belts to be easily coupled or uncoupled.

Two types are available for such application as large machine tools, presses, shears, rolls, and blowers. A rubber-coated belt is for standard applications; an oil-proof one is for oily and high-temperature drives.

Manheim Mfg & Belting Co, Manheim, Pa



Surface Measuring Instrument Separates Characteristics

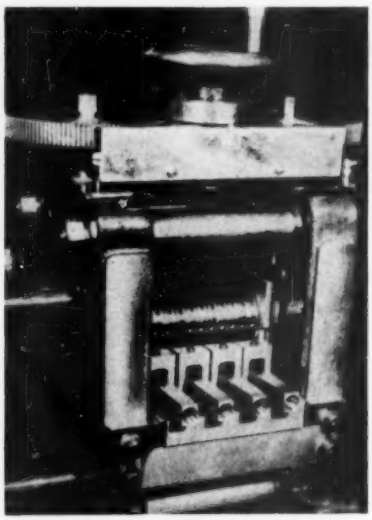
Brush Electronics is manufacturing an instrument designed to measure the roughness of any surface. It provides a non-destructive test, is said to be versatile, inexpensive, and to require no special training for its operation.

The surface-roughness range measured extends from 1 to 1000 mu-in. deviation from mean surface. Variable cut-off switch permits separation of waviness and roughness characteristics of surfaces by filtering out wavelengths exceeding 0.003, 0.010, or 0.030 in. This feature is of importance for such applications as bearing surfaces and stressed parts.

Operation uses diamond-tip stylus whose mechanical motion is transformed into electrical signals by a movable-plate vacuum-tube transducer. Signals are amplified and indicated on meter as mu-in.

Unit is equipped with precision reference specimens which provide a simple and accurate calibration of the instrument.

Brush Electronics Co, 3405 Perkins Ave, Cleveland 14, Ohio



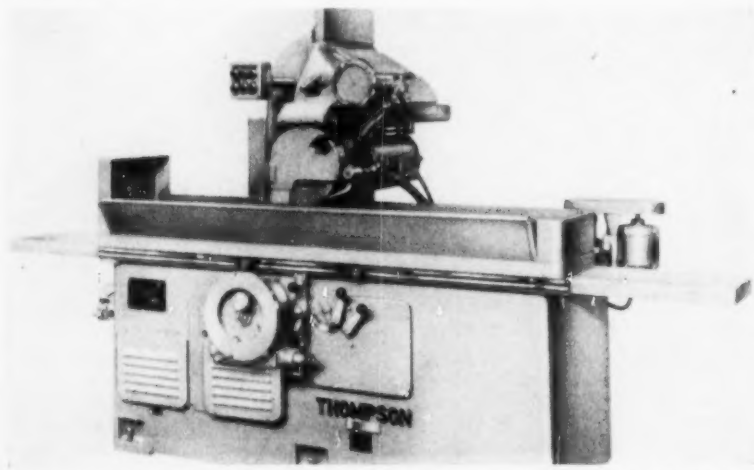
Modified Rolling Mills Do Tube-Reducing Jobs

Special modification of recently developed small wire rolling mills allows accurate and rapid tube reducing and tube sizing on a low-cost basis, according to Stanat Mfg Co. One of the many applications is the processing of tubular heating units.

The two most common tube-reducing machines are the series 100 and 200 rolling mills with 3-in. dia and 5-in. width and 4-in. dia and 6-in. width respectively. Features include housing cast of type GM Meehanite alloy, heavy bronze bearings, and upper rolls driven from lower rolls through hardened helical gears.

The exit and entry guides, made in special sizes to accommodate various diameters of tubing, can be seen in the illustration.

Stanat Mfg Co, Long Island City, NY



HYDRAULIC SURFACE GRINDERS range is 16 sizes from 6x18 to 12x120 in. Features are: crossfeeding wheelhead with horizontal spindle grinding with periphery of wheel; smaller increments of downfeed and wider increments of crossfeed; in-position wheel truing; low-pressure hydraulic system; automatic lubrication; and built-in coolant system — *The Thompson Grinder Co, Springfield, Ohio*

CAN YOU COMPETE SUCCESSFULLY?

or . . . is out-of-date equipment putting you out of the running?

Obsolete equipment is a vicious tax on your costs and production. . . it ruins efficiency . . . make costs spiral sky-high . . . puts the KO on your estimates instead of the OK you are bidding for.

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HELP YOU OVERCOME COMPETITION

Furnished in connection with any size or model of Sidney Lathe, the FLUID TRACER makes it the most modern turning tool . . . SIMPLEST TO OPERATE. Small runs or quantity production show TREMENDOUS SAVINGS PER FINISHED PIECE. Change-over to standard lathe operation or back to tracer requires only a few SECONDS because no addition or removal of parts is necessary.

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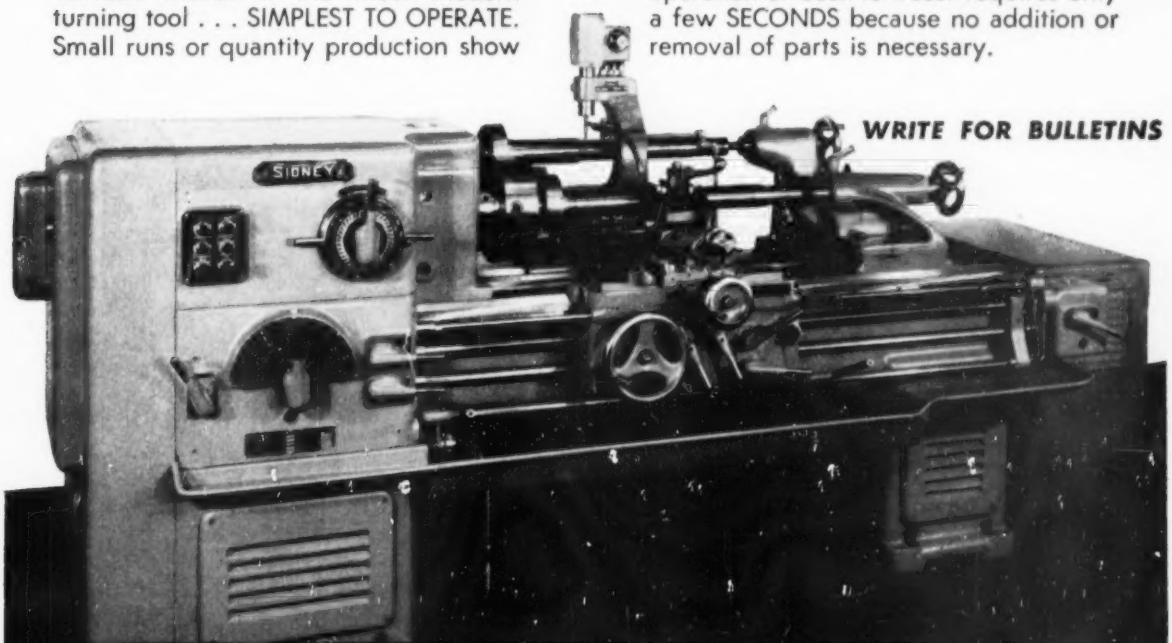

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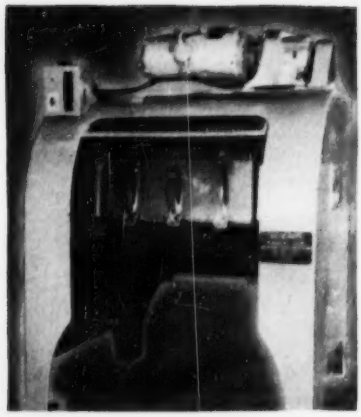


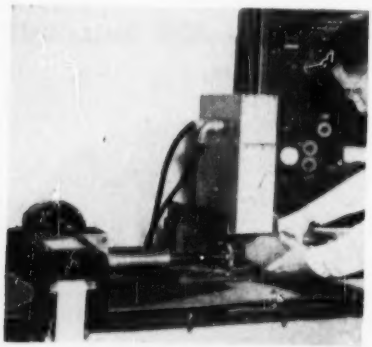
Machine Removes Slag, Burrs From Weldments, Machined Parts

BurrMaster barrel tumbler removes welding slag, flame-cutting slag, burrs, and rust from weldments and machined parts. It is reported that time-study records show majority of items processed can be deburred in 1/3 time it takes by hand; removal of slag takes 1/10 time.

Unit is of welded-steel construction except for aluminum barrel door. Neoprene linings extend barrel life and reduce noise. Barrel is 32 in. in dia and 48 in. long; load capacity is 1 ton. All moving parts are completely enclosed.

Variable-speed drive can be set for from 5 to 30 rpm. Other features include pushbutton control, self-locking drive, and electric timer.

White-Roth Machine Corp, Lorain, Ohio



Electronic Unit Inspects One Rocket Shell a Minute

Electronic rocket shell inspection device, developed by Standard Electronics Research to meet inspection needs at Picatinny Arsenal, helically scans the entire rocket head and records the results on paper tape. Inspection time per shell is reported to be 55 sec and the cost is said to be ¼ that of radiography method. System uses no photographic film and tests can be run by relatively untrained personnel.

Necessary equipment includes the X-ray power supply unit, recorder, scanner, transformer, and amplifier. The shell is moved helically through a very narrow X-ray beam. Any void in the charge or reduction in the shell wall thickness results in increased intensity of the beam after passing through. This beam impinges on a crystal which produces light rays which in turn strike a photocell to generate electric impulses that can be amplified. In addition to the paper trace, there are indications on an ammeter, an oscilloscope, and by means of two counters which can be preset independently to count voids above a predetermined volume.

The basic technique used was actually developed by Standard Electronics a few years ago to detect voids in the delay element of hand grenades.

Standard Electronics Research Corp, 2 East End Ave, New York, NY

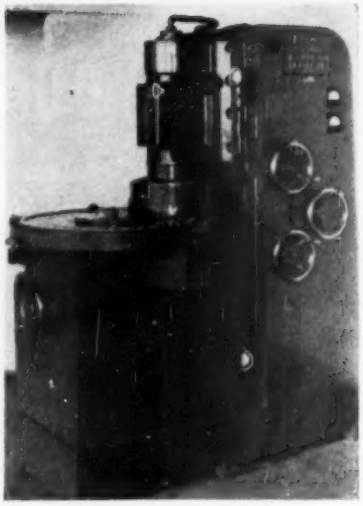
Hydraulic Honing Machine

Hydro-Hone machine for the liquid-abrasive cleaning and polishing of all metal parts is said to increase finish appearance and accuracy, speed production, and decrease upkeep cost. Specially designed pump eliminates packings entirely and allows fluid to bypass all bearings.

Automatic drain reportedly allows a 300% faster changeover from one abrasive to another. Blast-chamber visibility has been improved by increasing illumination to 1200 watts. Blower system completely changes interior air every three seconds.

Operator fatigue has been considered in the design of foot controls, front panel permitting sitdown operation, and wide inspection port placed at a natural vision angle.

Hydro-Hone Manufacturing Co, Huntington Park, California



Vertical-Spindle Unit Grinds Insulator and Trimmer Bases

Machine grinds two parallel surfaces of insulators and one surface of trimmer bases. Maximum stock removal is 0.005 in. with accuracy for flatness and parallelism of 0.0005 in. Production rate is 60 to 70 parts per minute.

Vertical column supports grinding heads upon vertical slides and each head slide is provided with handwheel and feed-screw mechanism for raising and lowering heads. Motor-driven pump circulates coolant to abrasive wheels through hollow spindles. Two 7½-hp, 1800-rpm motors power the unit.

Gardner Machine Co, Beloit, Wis

Progressive Air Gage Inspects Five Dimensions on Oil Pump Body

Progressive air gage for inspecting five dimensions on an oil pump body consists of three air spindles and a five-column Precisionaire.

Special spindle with single Balljet at the top checks depth and parallelism of inside surface of the oil pump body. Depth is indicated by float position in Precisionaire column, and parallelism by float variation as the part is moved around the spindle. Other two air spindles gage a bore diameter, radius, and concentricity of the bore with the radius. Each is connected to two air columns and they are identical except that one is for a bore size 0.007 larger.

Single jet in the large diameter of the spindle checks radius and is also used in conjunction with a jet in the smaller diameter for checking concentricity as the part is rotated. Set of jets in the smaller diameter is used for checking bore size.

Sheffield Corp, Dayton 1, Ohio

Photograph by Morton Berger

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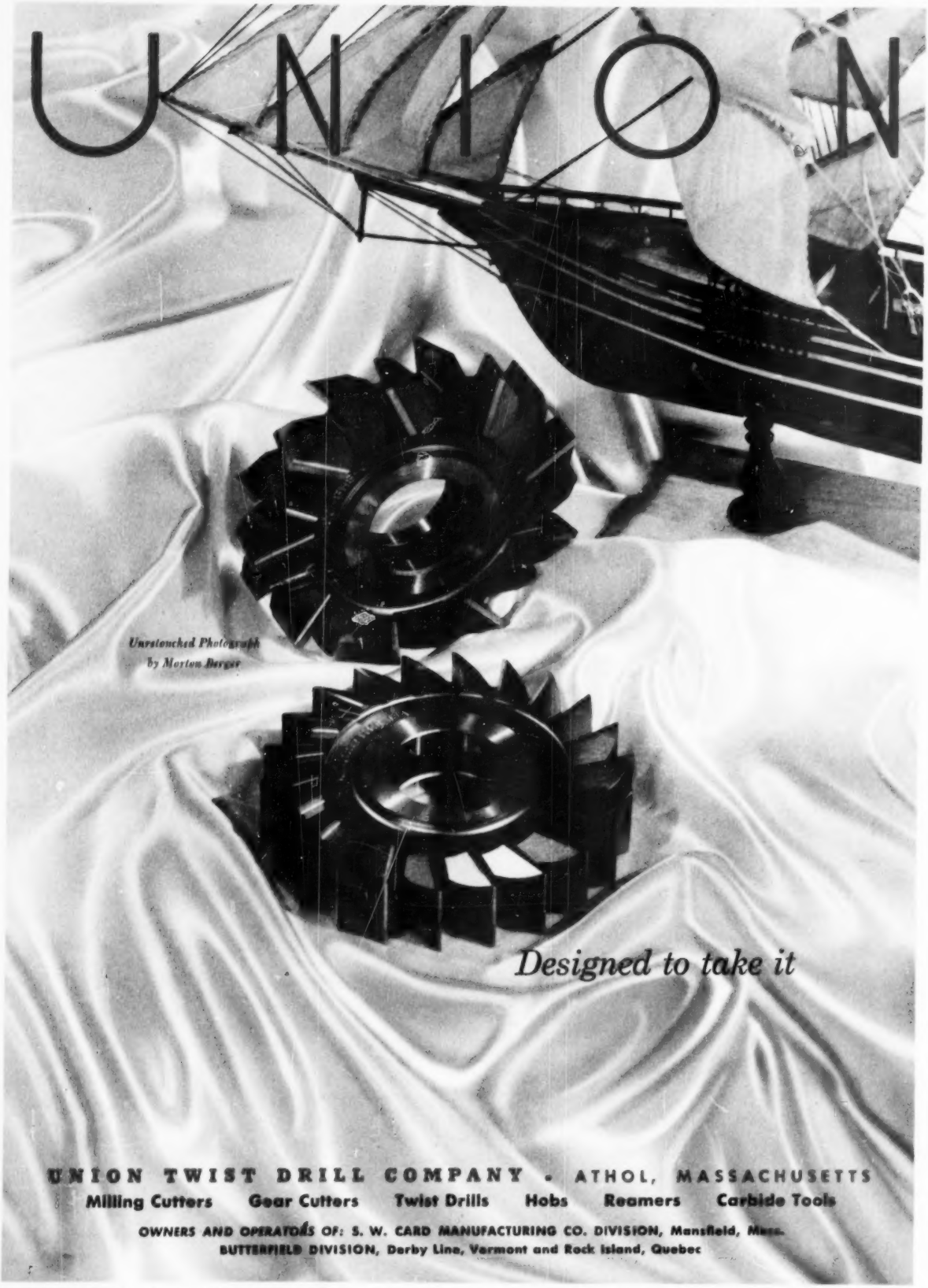

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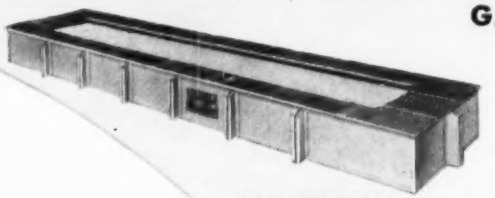

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This experience with our own furnaces in large volume production enables us to render a service to you far beyond other manufacturers. That is one reason why Sunbeam Furnace installations have been so successful. They are based not only on furnace engineering ability, but on practical experience under actual operating conditions. We have learned through actual experience the factors that give longest furnace life . . . greatest production . . . best quality . . . and lowest operating cost.

Our highly trained technical staff of furnace engineers who for over 50 years have built furnaces for the leading companies throughout the United States and abroad are qualified to recommend the correct type of furnace to meet your requirements.

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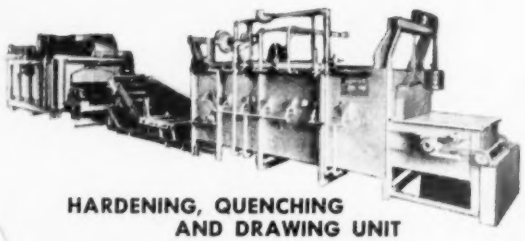
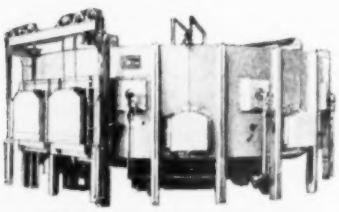
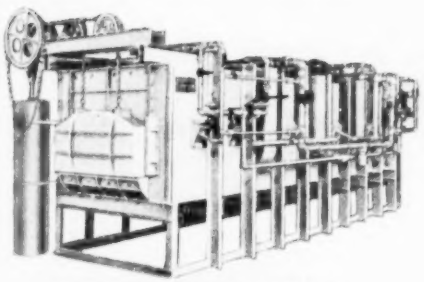
A letter, wire or 'phone call will promptly bring you information and details on Sunbeam Furnaces, either units for which plans are now ready or units especially designed to meet your needs. Or, if you prefer, a Sunbeam Stewart engineer will be glad to call and discuss your heat treating problem.



HARDENING, QUENCHING AND DRAWING UNIT

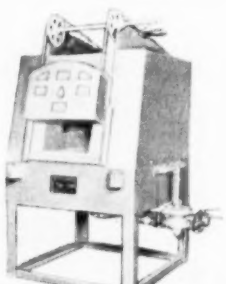


ROTARY HEARTH FORGE



PORTABLE OVEN FURNACE

RECIRCULATING FURNACES



SEMI-MUFFLE AND FULL MUFFLE OVENS

Sunbeam CORPORATION (Industrial Furnace Division)

Main Office: Dept. 119, 4433 Ogden Ave., Chicago 23—*New York Office:* 322 W. 48th St., New York 19—*Detroit Office:* 3049 E. Grand Blvd., Detroit 2
Canada Factory: 321 Weston Rd., So., Toronto 9

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FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 PRECISION LATHE—*Monarch Machine Tool Co, Sidney, Ohio.* 20-page illustrated booklet 502 covers 13-in. Model EE for manufacturing and toolroom operations. Design advances, construction features, attachments, specifications are included.

2 DI-ACRO SHEARS — *O'Neil-Irwin Mfg Co, Lake City, Minn.* 14-page booklet illustrates and describes four hand- and four power-operated units with 16-gage mild sheet steel capacity. Specifications, selection, setup, and operating data included.

3 ROLLING MILLS—*Stanat Mfg Co, Long Island City, NY.* 8-page bulletin 121 covers line of low-cost small units for laboratory and production work. Engineering features, accessories and specifications provided.

4 HITCH FEED—*H E Dickerman Mfg Co, Springfield, Mass.* Bulletin illustrates 2½-in. Model K for attachment to any press. Unit, designed for extra strength and additional feed length, handles stock up to 0.031 in. thick. Features and specifications provided.

5 ELECTRONIC MACHINE TOOL—*Elox Corp of Michigan, Clawson, Mich.* 4-page bulletin illustrates the M-400 for precision tool and die work; drills shaped or round holes in tungsten carbide and regular tool steels. Performance features outlined.

6 SINGLE-SPINDLE AUTOMATIC—*Cleveland Automatic Machine Co, Cincinnati 12, Ohio.* 4-page bulletin illustrates detailed data on 2½-in. Model AW. Includes feed chart and complete specifications.

7 PRESSURE PROCESSING PRESSES—*Hydraulic Press Mfg Co, Mount Gilead, Ohio.* 12-page bulletin 5004-A describes complete line; each type illustrated; application data and available sizes included.

8 AUTOMATIC TURRET LATHE—*Potter & Johnston Co, Pawtucket, RI.* 8-page illustrated bulletin 131 presents data on the 5-D Power-Flex model. Special features, automatic chucking equipment, dimensions provided.

9 DRILLING & TAPPING MACHINES — *Edlund Machinery Co, Cortland, NY.* 8-page bulletin 130 illustrates data on Models 2, 3, and 4B vertical motor cone-pulley drive units. Attachments and specifications included.

10 MACHINE TOOLS — *Reed-Prentice Corp, Worcester 4, Mass.* Catalog contains illustrated, descriptive circulars on engine lathes, toolroom lathes, and vertical milling machines. Includes features, attachments, and specifications.

TOOLS AND ACCESSORIES

11 DIE MANUAL — *Verson Allsteel Press Co, Chicago 19, Ill.* 112-page illustrated presentation of press brake dies and special tooling with detailed text and selection tables.

12 SPECIFIC TAPS — *Detroit Tap & Tool Co, Bass Line, Mich.* 32-page bulletin ST-53 gives tap form, size availability, and prices. Five sections list taps for specific materials with descriptions explaining characteristics for suitability.

13 GUN DRILLS — *Eldorado Tool & Mfg Corp, Milford, Conn.* 8-page pamphlet, reprint from an AMERICAN MACHINIST article, is a complete discussion of uses and techniques for various operations. Illustrated with charts, drawings, photographs.

14 CYLINDRICAL CORRECTION CHART FOR ROUNDS — *Wilson Mechanical Instrument Div, American Chain & Cable Co, New York.* Pocketsize chart indicates corrections to be added to hardness values when comparison between cylindrical and flat surface is needed.

15 AIR GAGE—*Federal Products Corp, Providence 1, RI.* 23-page catalog 53B describes Dimensionair, including cali-

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brated dial, single master system, with specifications and accessories. Automatic sorting and machine control applications included.

16 KEYWAY BROACHES — *du Mont Corp, Greenfield, Mass.* 12-page catalog contains illustrated information on Minute Man line, including combination sets, push-type production broaches, arbor presses, and magnetic bases. Data on keys and keyways provided.

17 SAWS—*Caswell Mfg Co, Hartford 2, Conn.* Three illustrated booklets on bandsaws, power, and hand hacksaws cover operational and maintenance data, selection information and charts.

18 HONING TOOLS—*Barnes Drill Co, Rockford, Ill.* 6-page bulletin 500 contains illustrated data on three types for general purpose and high production. New design provides 200 to 500% more stone life. Available in mechanical, hydraulic, and electric expansion models.

19 TOOLS FOR TURRET LATHES—*Morey Machinery Co, New York 13, NY.* 40-page catalog 564 offers detailed illustrated information on extensive line. Includes specifications, tables, and index.

20 MARKING EQUIPMENT — *Acromark Co, Elizabeth, NJ.* 130-page indexed catalog 53 illustrates and describes over 650 items. Request on company letterhead.

HEAT-TREATING AND WELDING

21 FURNACE & OVEN CONTROL — *Bristol Co, Waterbury, Conn.* 48-page expanded catalog P1260 covers complete systems for specific installations, described and pictured. Applications, dimensional drawings, engineering data, prices, accessories listed.

22 WELDING—*Eutectic Welding Alloys Corp, Flushing 53, NY.* 32-page DirectoRod Guide gives recommendations for over 300 types of metal joining operations. Includes illustrated applications; charts list electrodes, alloys, and fluxes recommended for various base metals.

23 BURNER EQUIPMENT—*American Gas Furnace Co, Elizabeth, NJ.* 54-page catalog C6A contains detailed information, specifications, and applications on extensive line including blowpipes, cross fires, hand torches, oxygen-gas equipment. Request on company letterhead.

PLANT SERVICE EQUIPMENT

24 TUMBLING BARRELS — *Globe Stamping Div, Hupp Corp, Cleveland 2, Ohio.* 12-page illustrated catalog B-9 describes complete line of horizontal and tilting units, and new flask-type model. Special features demonstrated, as well as capacity charts, and applications.

25 ANTI-RUST PAINT — *Speco, Inc, Cleveland 9, Ohio.* 7-page bulletin recommends uses for six Rustrem colors as finish coats for structural steel, machinery, etc.

26 CRANES — *Overhead Crane Div, Harnischfeger Corp, Milwaukee 46, Wis.* 24-page brochure illustrates variety of installations. Includes explanatory diagrams and specifications.

27 SURFACE FINISHING — *Metablast Div, American Metaseal Mfg Corp, West New York, NJ.* 4-page bulletin on Metablast process for controlled finishing. Detailed description of operation of machine, solution of variety of problems, specifications, special features, accessories.

28 SPRAY NOZZLES—*Spraying Systems Co, Bellwood, Ill.* 48-page indexed catalog 24 illustrates and describes standard and special units, giving capacity, spray angle, dimensional specifications for each. Data included on related equipment.

29 FORK TRUCK OPERATOR'S TRAINING MANUAL—*Clark Equipment Co, Service Div, Jackson, Mich.* 41-page illustrated brochure covers operational functions, actual training course with questionnaire, preventive maintenance charts.

30 ELECTROSTATIC SPRAY — *Ransburg Electro Coating Corp, Indianapolis, Ind.* 16-page booklet on No. 2 Electro-Spray process for production line painting. Illustrates economy by case-history presentation of 27 jobs on variety of sizes and shapes of parts and products.

31 PROTECTIVE EQUIPMENT—*Chicago Eye Shield Co, Chicago 12, Ill.* 64-page catalog 27 illustrates wide variety of head and eye safety items, including goggles, helmets, respirators, hoods. Request on company letterhead.

PARTS AND MATERIALS

32 VALVES & PRESSURE REGULATORS — *Hoke, Ine, Englewood, NJ.* 66-page catalog 2 describes complete line for fluid control, including needle, toggle, packless, and special-purpose valves, accessories and fittings. Engineering data, applications, specifications provided.

33 HIGH TEMPERATURE ALLOYS—*Firth Sterling, Pittsburgh 30, Pa.* 4-page bulletin 301 describes five grades. Typical analysis, characteristics, applications, machining data, forging instructions covered.

34 ELECTRONIC EQUIPMENT HANDBOOK — *Alden Products Co, Brockton 64, Mass.* 1954 edition of "Ideas-Techniques-Designs" deals with new standard components for utilizing electronic equipment. Data and planning sheets on plug-in packages and basic chassis for giving 30-second interchangeability. Request on company letterhead.

35 TIME SWITCHES—*General Electric Co, Schenectady 5, NY.* 24-page bulletin GEA-5965 covers line of switches, process timers, and time meters. Includes selection and application data, descriptions of types and models, features, specifications, operating data, and prices.

36 ADJUSTING SHIM CLUTCHES—*Lipe-Rollway Corp, 712 Emerson Ave, Syracuse, NY.* 3x2-ft illustrated metal-edged service chart describes eight steps. Lists model numbers, quantity of shims, and dimension "A" and facing thickness measurements for 166 different heavy-duty clutch models.

37 AUSTENITIC CHROMIUM-NICKEL STAINLESS STEELS—*International Nickel Co, New York 5, NY.* 32-page bulletin A-49 provides information on corrosion-resisting properties. 18 tables show results of tests in various solutions, acid, neutral, and alkaline.

38 CLAD METALS — *Superior Steel Corp, Carnegie, Pa.* 24-page "Introduction to Clad Metal" offers comprehensive survey of manufacture and applications of stainless-, copper-, brass-, and other clad steels. Characteristics, methods, and processes illustrated.

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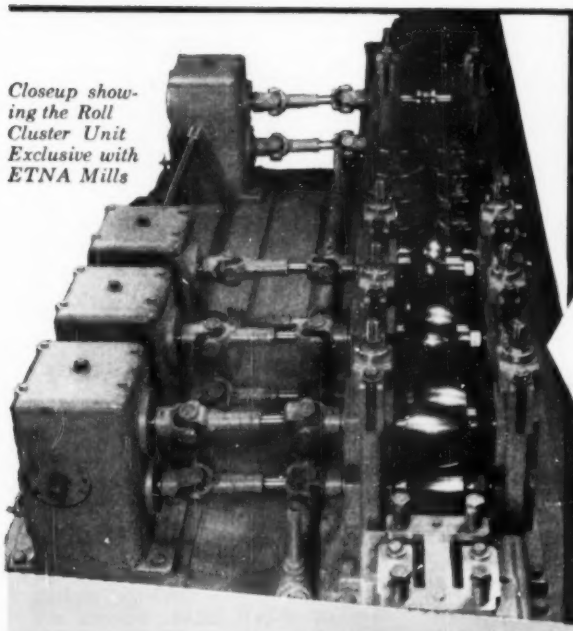
LEADING THE INDUSTRY IN DESIGN...

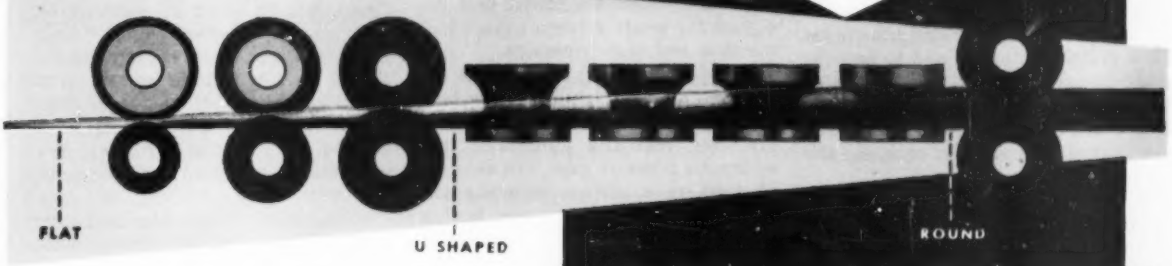


Closeup showing the Roll Cluster Unit Exclusive with ETNA Mills

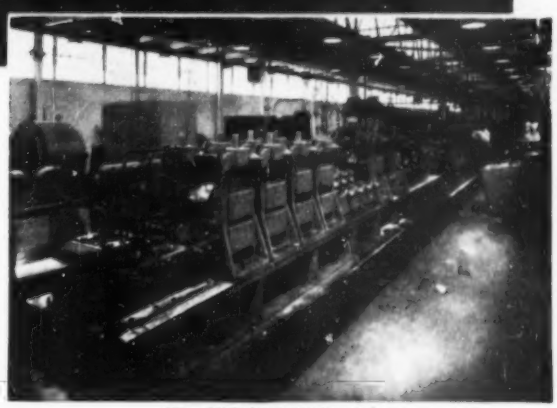
NO MARKING . . . NO SCRATCHING
NO UPSET EDGES . . .

THE Etna METHOD

FOR SMOOTH, WELL FORMED STEEL TUBING



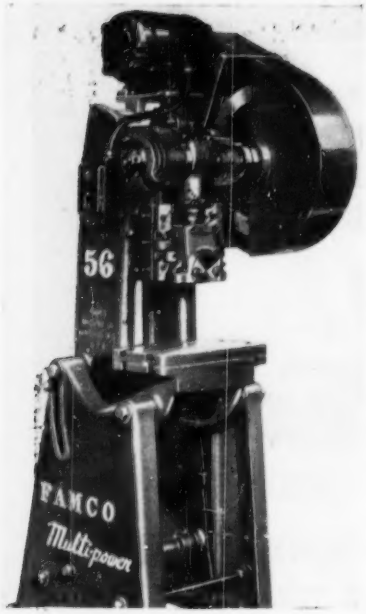
Exclusive with Etna is the cluster unit. This unit progressively rolls the tube into shape without excessive stretching of the edges, thereby eliminating the "buckling" experienced with ordinary tube mills. Etna machines are not forming mills, they are designed for one purpose only . . . to make clear, well formed carbon and stainless steel tubing with no marking, no scratching, no upset edges. Write for complete details.



The ETNA 4KU Mill

Abbey ETNA Company

3404 MAPLEWOOD AVE., TOLEDO 10, OHIO



Famco Expands Power Press Line With Addition of Two New Models

Two 13-ton power presses have been added to the Famco line.

Model 56-E Electromatic is equipped with electrically operated nine-point jaw clutch. Action is said to provide ease in operation and lowered maintenance costs. Model is adjustable for single-stroke non-repeat, or continuous action, without stopping the press.

Model 56-J incorporates a Famco-designed Multipower nine-point mechanical jaw clutch.

Both units are constructed of extra heavy cast semi-steel. They have one-piece, heat-treated alloy crankshafts, split bronze-bushed main bearings, and large ram area. Balanced fly-wheels are equipped with Timken tapered roll bearings. Standard equipment includes belt and fly-wheel guard. Model 56-E can be furnished with two-hand safety pushbutton controls if desired.

Famco Machine Co, Kenosha, Wis

OCM catalytic exhausts are being used to replace regular mufflers on gasoline-powered fork lift trucks operating indoors. Completely assembled units, which can be quickly installed by simply bolting to the engine manifold, oxidize more than 95% of carbon monoxide and hydrocarbons in truck exhaust. Exhausts can be used on any engine, mobile or stationary, which burns unleaded gas, and can be easily adapted to LP engines. Available in standard sizes for any make or size of truck.

Oxy-Catalyst, Inc, Wayne, Pa

Portable Model of Radiac Abrasive Cutoff Machine

Portable machine is for dry cutting only and is equipped with a 10-hp motor operated by magnetic starter and remote control pushbutton mounted on wheel guard convenient to operator. Wheel spindle is driven by 7 V-belts and machine is arranged to operate an 18-in.-dia by ⅛-in. thick Resinoid bonded wheel at spindle speed of 2500 rpm. Two sets of wheel flanges are provided, 8 in. and 4 in. in dia.

Base of machine consists of two heavy angle irons securely bolted to journal bracket and vise table. Tapered dowel pins keep parts in place. Straight or swivel vise can be supplied.

Machine will cut pipe with OD up to 4 in. and solid stock up to 2½ in. OD.

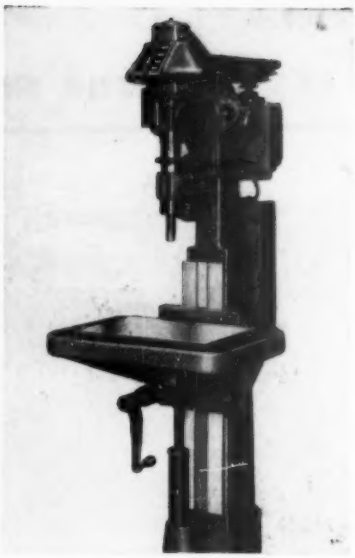
A P DeSanno & Son, Inc, Phoenixville, Pa

Air-Driven Hydraulic Pump

Air-driven hydraulic pump, available in single- or double-acting models, is a simplex horizontal unit designed for small volume capacity at medium and high pressures.

Pump develops up to 20,000 psi operating on 90 psi air supply. The self-contained machine, complete with air filter, regulator, lubricator, and hydraulic pressure gage, can be operated wherever air pressure is available. Applications include testing tubing, valves and pressure vessels, as well as supplying power for small molding presses.

Aldrich Pump Co, Allentown, Pa



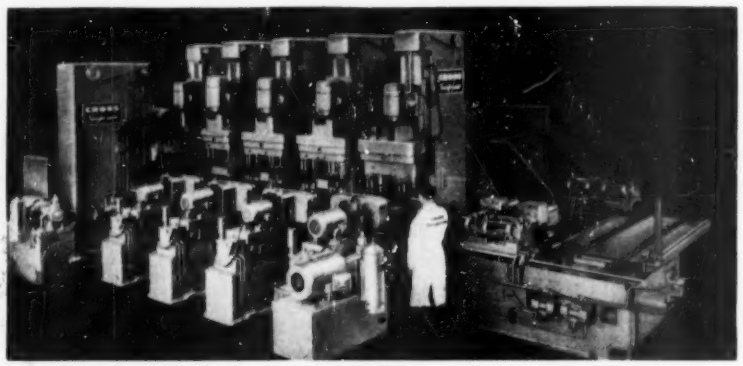
Avey Drilling Machine

Avey No. 1 machine has capacities from small number size drills up to No. 1 Morse Taper drills.

Unit is driven by standard ¾- or 1-hp 1200-, 1800-, or 3600-rpm motors through V-belt drive. Speeds are changed from front of machine by rack and pinion-operated motor plate, which provides adjustment for V-belt tension. Spindle speeds up to 12,000 rpm are obtained; each spindle, with built-in work light, is aligned on precision ball bearings, with telescopic guard over the spindle.

Three speed ranges are available: 1000 through 12,000, 500 through 6000, and 330 through 4000.

Avey Drilling Machine Co, Cincinnati 1, Ohio

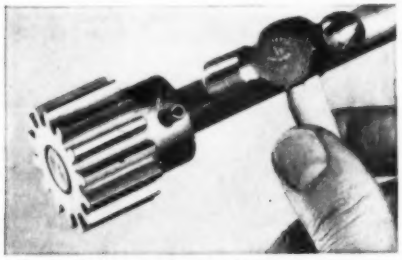


TRANSFER-MATIC processes intake manifolds at the rate of 218 per hr. Special machine, which has seven stations including loading and unloading, performs 54 operations: 22 drilling, eight chamfering, two reaming, 12 tapping, eight boring, and two milling. Two parts are machined simultaneously at each station. Palletized workholding fixtures carry irregular-shaped manifolds automatically from station to station; fixtures are operated automatically by power wrenches. Unit is equipped with preset tools, built-in chip conveyor, and automatic cleaning unit for removing chips from fixtures — *The Cross Co, Detroit 7, Mich*

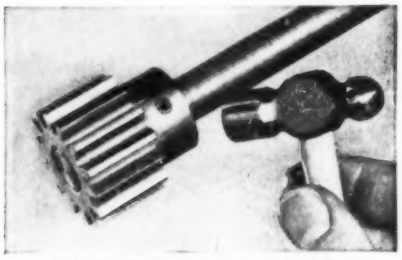
Where can you use this simple fastener?

No threading, peening or precision drilling with ROLLPIN

Rollpin is driven into holes drilled to normal production-line tolerances.



It compresses as driven.



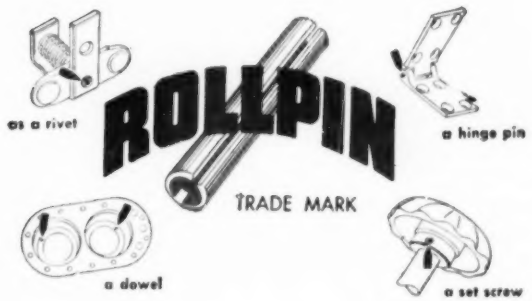
Rollpin fits flush . . . is vibration-proof.

Rollpin is the slotted tubular steel pin with chamfered ends that is cutting production and maintenance costs in every class of industry.

This modern fastener drives easily into standard holes, compressing as driven. Its spring action locks it in place—regardless of impact loading, stress reversals or severe vibration. Rollpin is readily removable and can be re-used in the same hole.

* * *

If you use locating dowels, hinge pins, rivets, set screws—or straight, knurled, tapered or cotter type pins—Rollpin can cut your costs. Mail our coupon for design information.



Elastic Stop Nut Corporation of America
Dept. R16-129, 2330 Vauxhall Road, Union, N. J.

Please send me the following free fastening information:

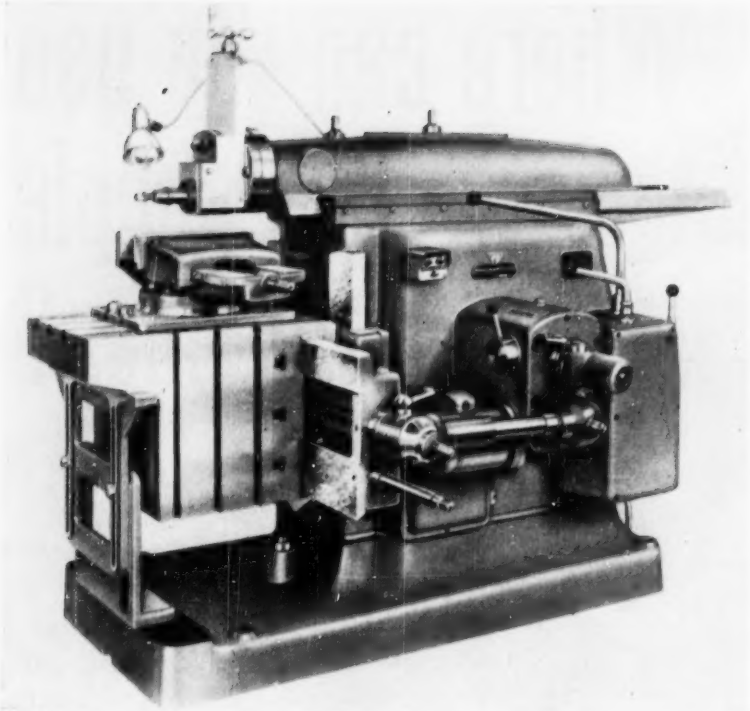
☐ Rollpin bulletin
☐ Elastic Stop Nut bulletin
☐ Here is a drawing of our product. What fastener would you suggest?

Name _____ *Title* _____

Firm _____

Street _____

City _____ *Zone* _____ *State* _____



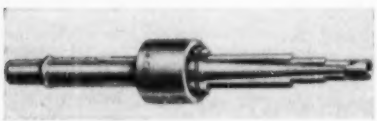
Swedish Shapers Available in Utility and Heavy-Duty Models

VMA plain and universal shapers, manufactured in Sweden, are available in this country in two series, Type E utility, and Type ES heavy-duty production.

Type E units are made in three sizes: 14-, 18-, or 22-in. stroke, in plain type only, but with swiveling table or tilting table top available as extras. Selection of six ram speeds and four power table feeds through conveniently located hand levers is provided. Automatic vertical feed to toolpost is also available on the 18- and 22-in. machines.

Type ES models are manufactured with 18-, 22-, or 26-in. stroke and with plain or universal tables. Eight ram speeds and ten table feeds are provided through newly designed, completely enclosed feed mechanism. Units are equipped with separate motor for horizontal table power rapid traverse; built-in safety device prevents operation unless ram is stationary. Centralized lubrication system covers all moving parts. Accessories available include keyway cutting attachment, automatic vertical toolpost feed, and automatic tool lifter.

Imported by Austin Industrial Corp, 76 Mamaroneck Ave, PO Box 430, White Plains, NY



Expanding Mandrel in 11 Sizes Takes Wide Size Range of Bores

Count-Centric expanding mandrel is available in 11 sizes to accommodate every size bore from ⅜ to 7 in.

Work is held by three keys sliding in grooves on a 3° taper. Keyfaces are always parallel, automatically centering the work. Longer gripping surface of parallel keys prevents marring or distortion in the bore, and permits cuts as deep as ¼ in. in tap which slides keys up to taper; precision finishing of both keys and slots assures secure grip. Tap at other end quickly releases work.

Mandrels have two or three steps, maximum expansion of each overlapping minimum diameter of the next; each overlaps the next larger size, so that any fractional or decimal size bore can be accommodated within the ⅜ to 7-in. range.

Le Count Tool Works, 390 Capitol Ave, Hartford, Conn

Mechanical Remote Control System For Production Grinding Machine

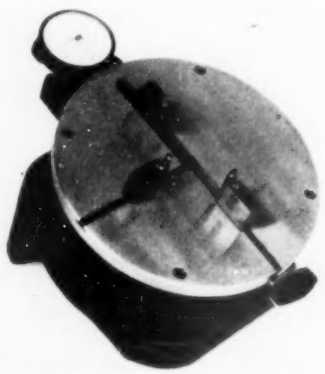
Teleflex has designed a front-panel control grouping for a hydraulic production universal grinder. The system brings as many as eight controls to the front of the machine which were formerly accessible only behind a panel at the side or rear.

Each of the original control knobs has been replaced by a small hobbed wheel into which is meshed a spiral-clad cable acting as a long, flexible rack. Cable transmits push-pull motion as it travels through a precision-made tube, formed to follow the most convenient path. At operator's end, a similar set of hobbed wheels provides manual control by means of rotating knobs.

A simpler control box was developed, enclosing the hobbed wheel, and allowing complete disengagement of the cable—without disturbing mounting of wheel—for adjustment. All controls can be quickly disconnected to facilitate removal of entire hydraulic envelope.

Similar machine-tool uses of the Teleflex system are turret lathes and disk grinders; variety of other applications are in experimental and design stages.

Teleflex, Inc, North Wales, Pa



Bench Comparator Measures Both Inside and Outside Diameters

Acra-Ment K7-R bench comparator has been introduced for accurate, quick gaging of ID or OD on short or production runs. Unit illustrated is the T-plate type with adjustable ID or OD jaws; it is also available with other jaw arrangements made to specific requirements.

Gage has a heavy, surface-ground top plate forming a bridge with an extra-heavy, precision-machined base, and is equipped with a fine setting adjustment for easy, accurate setup.

Acra-Ment, Gage Div of Myer Corp, 633 Park Ave, Cranston, RI

MAXITORQ
Overload Release CLUTCH
minimizes machine Down-Time

AT THE
GILLETTE SAFETY RAZOR CO.

The Maxitorq automatic Overload Release Clutch was designed especially to protect high-speed machinery, and we are gratified to have testimonials such as the following:

> "The Gillette Safety Razor Company chose the Maxitorq Overload Release Clutch to protect a section of their blade and shaving cream packaging machines against costly down-time due to unpredictable machine jams.
>
> "Over a period of a year, wrapping millions of blades per week, Maxitorq Clutches have eliminated machine down-time except in a few minor instances. Thus, more constant production has been maintained in the packaging department."

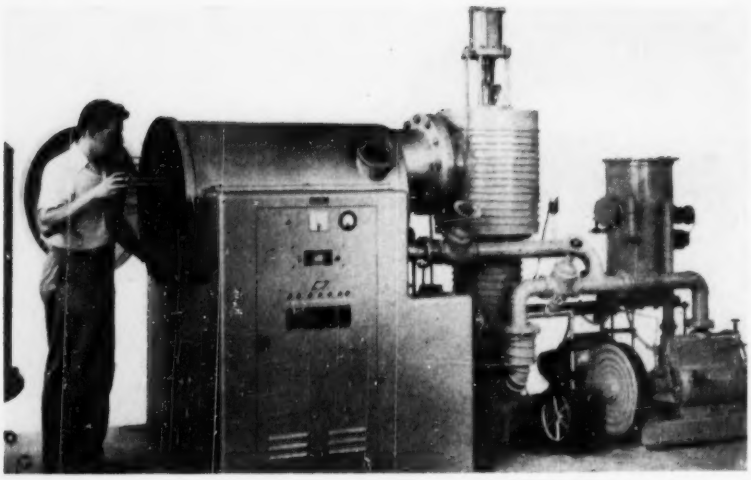
When an accidental overload occurs, the clutch automatically releases, stopping the machine, preventing damage to machine and product. When the jammed condition has been cleared, the clutch is re-engaged and the machine is again in operation. By means of a simple finger-tip adjustment, the clutch is set to transmit the normal running load.

There are six sizes, ¼ to 5 h.p. @ 100 r.p.m.; max. working torque ft. lbs. 13 to 263. Maxitorq "floating" discs prevent heating in neutral, and all assembly, take-apart, and adjustments are manual; disengagement is instant and complete. Submit your clutch problems to our engineers for practical solutions.

SEND FOR CATALOG NO. AM-12.

8CJ53

THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER • CONNECTICUT



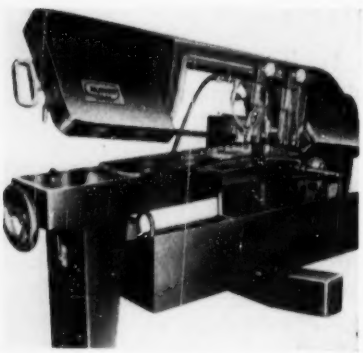
Vacuum Coating Unit Designed For Small-Shop High Production

Vacuum coating unit LC1-30, designed for smaller metallizing companies, has a normal production rate of four cycles per hr; with base materials of low volatile content, five cycles per hr may be attained.

Model has a 30-in.-dia horizontal chamber complete with fixtures and filament holder. Chamber is mounted at a convenient height on a steel cabinet containing filament power supply, fixture-rotating motor, and door-mounted electrical control panel, which opens to facilitate maintenance. Pumping system, which includes a high-speed, 14-in. oil diffusion pump, a small mechanical holding pump, and a 100-cfm mechanical pump for roughing and backing, is located at rear of the chamber, and is completely valved for maximum efficiency of operation.

Entire coating cycle is controlled from a unit point of operation; all essential valves, controls, and gages are accessible to the operator as he stands before the viewing port in the side of the chamber. Unit may be supplied with a stationary fixture for single surface coating, or with two rotating fixtures, each of which holds twelve riser rods.

Consolidated Vacuum Corp, 735 Ridge Rd, W, Rochester 3, NY



Metal-Cutting Bandsaw

Kalamazoo Model 8C horizontal metal-cutting bandsaw cuts 8-in. round stock, 16-in. flat stock, 8-in. pipe, and a variety of shapes, including very thin sections. Saw reportedly cuts with an accuracy of a few thousandths with minimum of kerf and leaves no burr.

Saw-frame descent through operation is maintained by a hydraulic mechanism. All parts are completely enclosed; cutting action is easily visible to the operator, and blade changes can be made in a matter of seconds.

Kalamazoo Tank & Silo Co, Machine Tool Div, 15 Harrison St, Kalamazoo, Mich

Soluble-Base Cutting Oil

Dasco soluble-base oil has been developed for metal cutting and grinding. Product's extra cutting and high grinding value, stability, and resistance to rancidity make it usable in leaner mixtures than ordinarily recommended for soluble oils. Mixtures usually start at 40 to 1 for milling, drilling, turning, boring, sawing, and reaming. Grinding mixtures leaner than 100 to 1 have reportedly given good results.

D A Stuart Oil Co, Ltd, 2727 S Troy St, Chicago 23, Ill

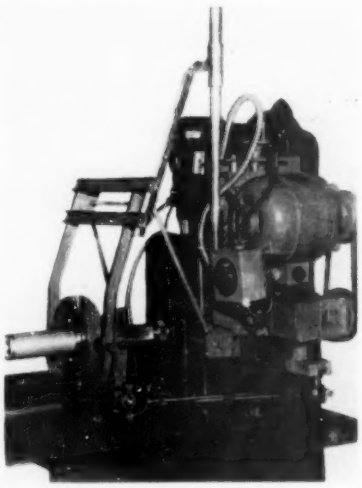
Precision Automatic Lathe for Mass Production of Small Parts

Howard D-500 Swiss type high precision automatic lathe has been designed to provide extreme accuracy, concentricity, and high finish in mass production of small, slender parts. By using a stop attachment, parts up to 12 in. long, having total turned lengths not over 4 in., may be produced on the ½-in.-capacity unit.

Machine is said to maintain the best features of its predecessor, the Wickman No. 2; construction is heavier, however, and improvements have been made to increase production, speeds, and accuracy.

Attachments for drilling, chamfering, counterboring, tapping, threading, slotting, and tapering are available; these, and many of the parts of the former machine are interchangeable on both.

Detroit Cam & Tool Co, 195 W Nine-Mile Rd, Ferndale 20, Mich



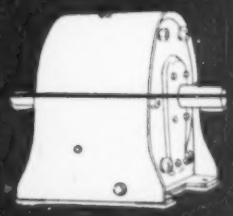
Stroking and Timing Attachment Developed for Automatic Honing

Automatic stroking and timing attachment for converting manually operated honing machines into completely automatic units has been developed by National Pioneer. According to tests, an operator can add 1/3 to his manual production on a single machine with the attachment, or he can run several machines simultaneously, depending on the work cycle. Spherical honing is said to be practicable with this device.

Standard attachments are available for practically all horizontal honing machines, including Sunnen, Ammco, and Superior; specials supplied to order.

National Pioneer Co, 1134 Nebraska Ave, Toledo 7, Ohio

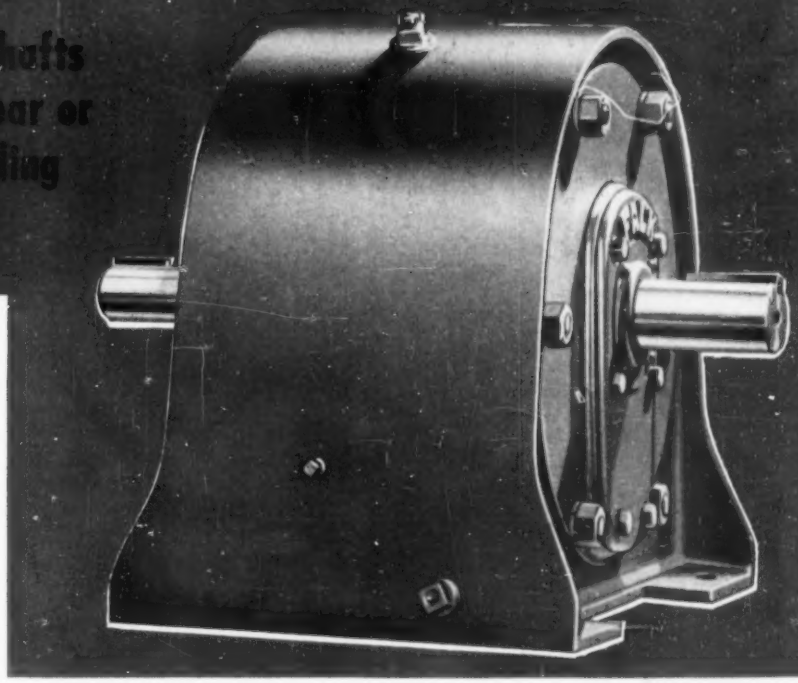
The versatile, STRAIGHT LINE

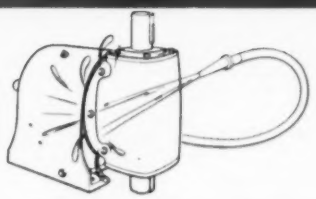


ALL-STEEL FALK SPEED REDUCER

(Concentric Type)

High and low speed shafts suitable for V-belt, gear or chain as well as coupling connections





The Type "C" Speed Reducer has these "In-built" Factors:

Sealed Housings. Dual closures and one-way vents keep oil in, dust and moisture out. Units are splash-proof, leakproof, dust-proof.

Positive Lubrication. Large sump capacity . . . oil-tight construction assures clean lubricant . . . direct dip of revolving elements provides positive lubrication at all speeds.

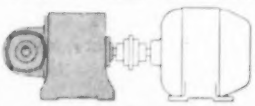
Precision Gearing. Heat treated alloy steel, precision cut and shaved helical gearing throughout . . . quiet-operating crown shaved pinions . . . taper bored gears for easy ratio changes.

Wide Speed Range. Selective ratio combinations provide output speeds from 1.5 rpm to 1430 rpm with stock gears.

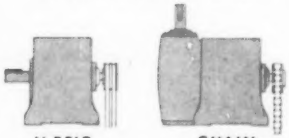
All-steel Housings. Unbreakable, strong, rigid. Generous overhung load capacities provided by wide bearing spans, large shafts and bearings.

Streamlined inside and outside. Smooth, clean surfaces; machine welded construction conforms to NEMA motor frames.

A FEW TYPICAL DRIVES FOR "C" AND "CB" UNITS



COUPLING TO "CB" UNIT



V-BELT TO "C" UNIT

CHAIN TO "CB" UNIT

Write for Bulletin 1104

The ideal type for Turbine, Engine or Special Motor

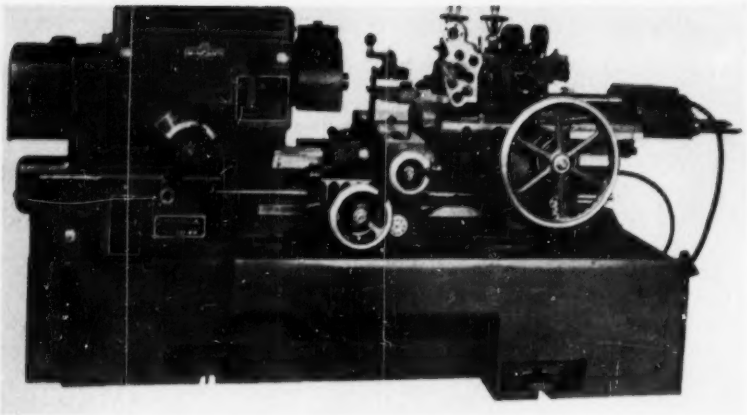
Here is an exceptionally versatile member of the famous FALK line of reduction units. The Type "C" Straight Line Speed Reducer is an all-steel concentric shaft unit rated in accordance with AGMA standards. It is structurally similar to the universally popular FALK Motoreducer, and offers many special application advantages.

It can be driven by motor, turbine or engine with direct coupling connection—or through a V-belt or chain drive. It lends itself effectively to hydraulic coupling, brake-wheel or overload protective coupling, multi-speed transmission, or to variable speed drives—without modification. Units can include self-contained backstop if desired. Ratio can be modified with easily installed stock gears. With modifications, unit can be used as a speed increaser.

These all-steel Straight Line Speed Reducers are *available for prompt delivery* in standard ratios in horizontal and vertical concentric models, also in horizontal and vertical right-angle models; in single, double, triple and quadruple reduction. For full details, write for Bulletin 1104.

FALK ...a good name in industry

THE FALK CORPORATION · 3001 W. Canal St. · Milwaukee 8, Wis.



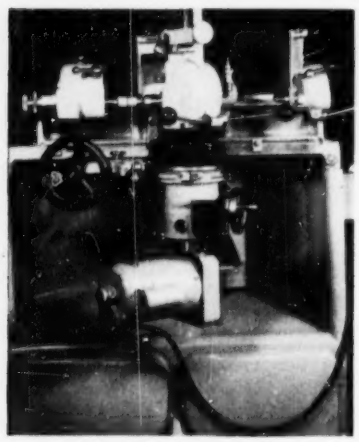
Automatic Turret Lathe Easily Set Up For Short- or Long-Run Production Jobs

Minganti 40-E automatic electrocycle turret lathe is designed for short- or long-run production jobs.

Operator runs through the cycle by hand, adjusting stops and trying feeds and speeds available, then selects the proper trip dogs in the hydro-selector, and machine is ready to operate automatically. Machine is loaded, push-button starts cycle, and upon completion, finished piece is removed.

When turret operations are underway, cross-slide cuts continue manually or under power. Turret approaches work hydraulically at a rapid traverse speed of 200 ipm; as it comes into contact, it drops automatically into the mechanical feed range. Upon completion of cut, machine drops back into rapid traverse hydraulic return. Turret indexes and locks; spindle changes to preselected speed and feed as cycle starts again.

Imported by S & S Machinery Co, 140 53rd St, Brooklyn, NY



Versatile Cutter Grinder

Kerns universal and contour cutter grinder handles any ordinary cutter, and can grind all types of complex contour milling cutters.

Knee-type linkage on which grinding column is mounted permits it to float into any position, with complete visibility for the operator; column is capable of 360° rotation about its floating center. Operator can guide the wheel anywhere along the work and approach it from any angle while maintaining contact of stylus with templet. Locking of a collar clamp converts the machine into an ordinary grinder.

Kerns Manufacturing Corp, Long Island City, NY

New Silicone Rubber Stocks Developed by Dow Corning

Silastic 675 is a silicone rubber stock developed for fabricating gaskets, seals, diaphragms, O-rings, bellows, switch boots, and dielectric fittings and connectors.

Product is said to have lowest long-term shrinkage, 1.8 to 2.5% of any similar stock, and lowest compression set values of any silicone rubber with nontoxic additives. Tear resistance is in the range of 80 to 90. Material is serviceable at temperatures ranging from –100 to +500 F. Product can be molded in dies designed for organic rubber parts where tolerances are not too close.

Silastic 132, a cloth coating paste, has also been introduced. Material is said to have superior handling characteristics, maximum abrasion resistance, and good dielectric properties.

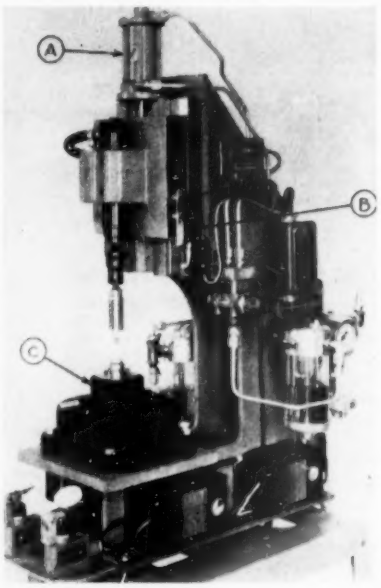
Dow Corning Corp, Midland, Mich

Dial Saw Equipped for Wide Range of Applications

Dial saw has been designed to cut any size hole from 1⅛ to 2½-in.-dia in metal, wood, plastics, and other materials. Three high-speed steel cutting blades are adjusted simultaneously by calibrated dial.

By removing pilot drill, unit can be used as a rotary planer or grooving tool, cutting any width from 1⅛ in. up, and is applicable for use as an inlaying tool. Can be used with electric or manual hand drill, drill-press, lathe and milling machine. Available in two shank sizes: Model 250, with ¼-in., and Model 375, with ⅜-in. Price, $12.95.

Robertson & Ruth, Box 534, Elmhurst, Ill



Air Units Speed Spark Plug Assembling

Spark plug assembly is made easier through a combination of electrical and pneumatic devices designed to drive home the locking nut on Duchess plugs.

Spark plug is placed in LS-1 collet fixture (C). Main air valve is opened to supply pressure on opposite side of machine. Double-acting cylinder (A) moves dovetail slide, carying nut setter toward plug. Cam finger (B) attached to dovetail slide trips microswitch roller, energizing two way solenoid supplying air to nut setter. 4-B bench valve is shifted releasing LS-1 collet fixture. Air press stand is employed for basic machine member. Complete time cycle is 3 seconds.

Mead Specialties Co, 4114 N Knox Ave, Dept LS-4, Chicago 41, Ill

Unless your operators work for nothing...

The savings in time alone will pay for New

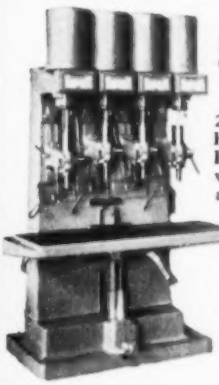
LELAND-GIFFORD DRILLING MACHINES

Convenient central controls, stepped-up speed, reduced work handling, built-in safeguards against costly errors, fast speed changes, quick adaptability to different jobs are some of the time-saving features of the new Leland-Gifford Drilling Machines which make it possible for the average operator to greatly increase machine production. And with the added advantage of higher precision, he can produce *better* work at the same time.

Leland-Gifford offers a complete line of motor spindle drilling machines — plus unsurpassed engineering skill and facilities for designing special tooling and adapting standard machines to meet any production drilling need. A Leland-Gifford field engineer can show you how to improve production and lower drilling costs with Leland-Gifford methods. Call the office near you.

No. 1LMS

Smallest holes up to 5/16"
Bench or floor types
One to Six Spindles
Speeds up to 10,800 RPM
12 or 20 inch Swing
Hand or Hydraulic Feed
Tapping by Friction
Tapping Attachment

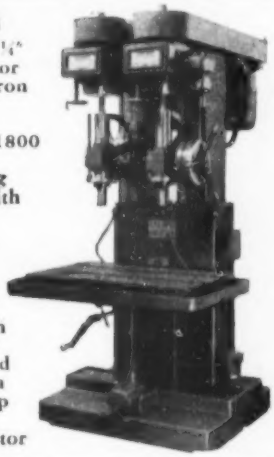


No. 2LMS

Holes from 1/16" to 3/4"
One to Six Spindles
Speeds up to 3600 RPM
20 or 26 inch Swing
Hand Feed;
Power Feed with three feed rates and Positive, Adjustable Depth Stop; or Hydraulic Feed — either plain or step-by-step.
Tapping by Reversing Motor or Friction Tapping Attachment

No. 3MVB

Holes up to 1 1/4" in Mild Steel or 1 1/2" in Cast Iron
One to Four Spindles
Speeds up to 1800 RPM
24 inch Swing
Power feed with three Rates, Adjustable Depth Stop and Safety Slip Clutch.
Also can be furnished with Hand Feed or Hydraulic Feed — either plain or step-by-step
Tapping by Reversing Motor



HYDRAULIC FEED

Two types of hydraulic feed are available — the well-known step-by-step type for deep hole drilling; and a plain feed for shorter holes or reaming. With either type the feed rate is *infinitely adjustable* and *independent*, and the maximum thrust pressure may be regulated with an overload release which withdraws the drill when the pressure exceeds a predetermined setting.

SAVE DAYS — CONTACT THE OFFICE NEAREST YOU

LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

Marking...

ANY CONTOUR...
ANY MATERIAL...
with
MARKING DIES...
by Parker

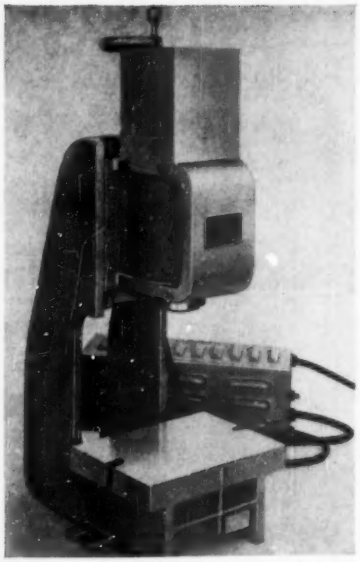
CHAMPION CONTAINER CO.
PHILA., PA.
HALF GAL.
LIQ. CONT.
THIS SCENTIFIC BEAUTY PREPARATION FORMULATED AND USED IN THE ERNO LASZLO INSTITUTE OF NEW YORK

Whatever the stamping requirement, Parker ingenuity and skill can produce one . . . two . . . or thousands of dies engineered to your specific needs, to your exacting specifications.
The applications of Parker marking dies are countless — ranging from simple legends . . . trademarks . . . dies with removable inserts . . . to dies that mark and simultaneously perform — crimping, indenting and other press operations.
Metal, wood, plastics — all can be permanently marked — regardless of surface contours — with a wide variety of character sizes and styles.

SEND TODAY for "Marking Tools" Parker's new 32 page catalog.

THE PARKER STAMP WORKS, INC.
MARKING, DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT

by Parker



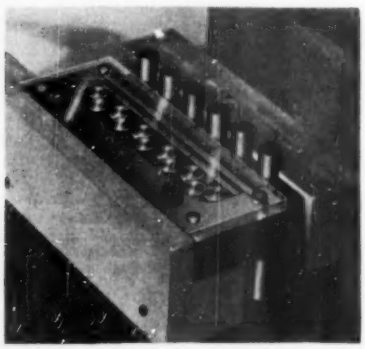
Impact Hammer Delivers 75 SPM

Bench-model, heavy-duty electric impact hammer delivers impacts adjustable from a few pounds to 10,000 lb at rates up to 75 spm. It is said to be particularly suitable for heavy-duty staking, crimping, punching, forming, riveting, and stamping.

Unit operates on electromagnetic principle, deriving power from specially designed solenoid. Selenium rectifier is used to transform ac to dc. Unit draws 25 amps during duration of power stroke—0.025 seconds. Machine has only one moving part: an integral unit consisting of armature and spindle moving in 3-in. honed bronze bearing.

Shut height can be adjusted from 1¼ to 6¾ in.; tool hole is ⅝ in. in diameter and 1 in. in depth. Stroke length is 2 in.

Black & Webster, Inc, Dept N 71, 445 Watertown St, Newton 58, Mass



Multiple Clamping Device

Device, called the Compensating Equalizer, clamps up to ten parts simultaneously by automatically

eliminate the guesswork in selecting tool steels

Thousands of metal working people are using the Crucible Tool Steel Selector to determine exactly which type of steel they need. This handy selector covers 22 tool steels which fit 98% of all tool steel applications.

The selector is unique because it starts with the ultimate use of the steel. It breaks down all tool steel applications into six major classifications, under which the different grades of steel available for certain specific requirements are indicated in legible cutouts. Heat treatment and machinability data are also included for each grade.

A flip of the dial will give you the answer, and almost just as quickly you can get the steel you select. For each type of steel shown on the selector is in stock in Crucible warehouses, conveniently located throughout the country.

To get your Selector merely fill in the coupon and mail. There is no obligation whatsoever.

⅓ actual size, Selector is in 3 colors

HERE'S AN EXAMPLE:

Application — Deep drawing die for steel

Major Class — Metal Forming — Cold

Sub-Group — Special Purpose

Tool Characteristics — Wear Resistance

Tool Steel — Airdi 150

A turn of the dial does it! And you're sure you're right

Crucible Steel Company of America
Dept. A, Oliver Building
Pittsburgh 22, Pa.

Name_____

Company_____ Title_____

Address_____ City_____ State_____

CRUCIBLE first name in special purpose steels

53 years of Fine steelmaking

TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.

Now... let new, extra durable

NU-TEX MOUNTED POINTS

cut your finishing costs to a minimum!

SAVE TIME AND LABOR

With new, longer lasting NU-TEX Mounted Points, you can eliminate filing, scraping, sanding or burnishing . . . grind, polish and deburr all types of metals and plastics in *one* simple operation. Their soft, cushion-like action produces even, extremely smooth finished surfaces quickly and easily . . . makes them ideal for use on all types of precision instruments and machinery.

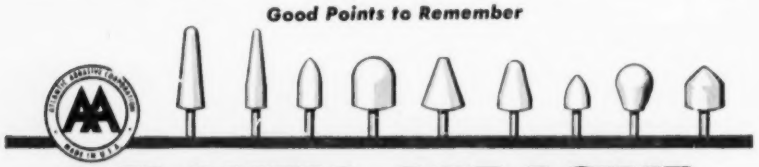
LOWER REPLACEMENT COSTS

Because they are bonded together with a special resin under an exclusive manufacturing process, you'll find that NU-TEX Mounted Points last longer under continuous operation . . . eliminate clogging or loading, even on softer metals. Reliable tests conducted in the Standards Department of a leading automotive manufacturer prove that NU-TEX Points cut downtime to a minimum . . . assure a better polishing and deburring action than any other product of their kind.

GET PROMPT SERVICE

By specifying NU-TEX Points, you eliminate costly shipping delays . . . choose from a complete line of points in all popular grit sizes . . . get prompt service on *every* order. Try them and see. Write now for complete details. Atlantic Abrasive Corporation, 516 Pearl Street, South Braintree 85, Massachusetts.

Good Points to Remember



ATLANTIC ABRASIVE CORPORATION

South Braintree 85, Massachusetts

compensating for size differences. It provides a definite mechanical lock for parts that are hard or soft, regular or irregular in contour. Can be applied to all types of vises for milling, grinding, and similar operations, and can be used as a component part of jigs and fixtures.

Compensators have separate, sliding jaws—one per workpiece in multiple machining—which are backed up by a chamber of floating vertical rollers; these shift position to exert equal pressure on each jaw. Jaws are held in unit by a common key permitting sufficient movement for automatic individual take-up.

Units are available in three types: one for multiple clamping of hard-metal parts; a second for soft material, such as aluminum and plastics; a third that will compensate for draft angle and surface irregularities on castings and forgings. Many sizes are available in each type; number of jaws range from 10 to 5, jaw widths from $\frac{3}{8}$ to $1\frac{1}{2}$ in.

Design Aids Co, North 7th St, Newark 7, NJ

Lightweight Spotwelding Gun For ⅛-in. Thick Sheet Metal

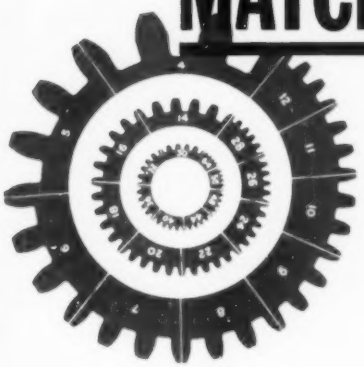
Lightweight Aircospot welding gun, with a 2/32-in. non-consumable thoriated tungsten electrode and an inert-gas shield, makes instantaneous welds on stainless, mild, and alloy steels, without jigs or fixtures.

Unit consists of a hand gun, control panel, and all necessary hose and cable assemblies. Standard dc power source, either motor generator set or rectifier machine, is required. Water-cooled gun uses helium or argon, or a mixture of both for a shield. High frequency is not required.

Gun is rated at 250 amp; welds may be made on sheet metal up to ⅛-in. thick, bottom section can be of greater thickness. In most cases a back-up plate is unnecessary.

Air Reduction Sales Co, 60 E 42nd St, New York 17, NY

MATCHED TOOLING for your GEAR LINE



At Michigan Tool, gear cutting and finishing tools for the same gear are MATCHED—matched to each other, matched in performance.

Matched tooling means greater assurance of accuracy throughout the life of tools. It means more gears per tool and lower tool cost per gear.

When your tools are *Matched*, they work in harmony, each with the other.

Michigan Matched gear cutting tools include ground and accurate unground hobs, shaper cutters, Shear-Speed cutting tools, gear finishing cutters or racks, also gear laps.

Michigan's own laboratory control of the high speed steels and heat treatment of the high speed steel tools assures the users of consistent highest quality in his *Matched* gear tools.

Insist on *Michigan Matched* Gear Tools for your gear production line.

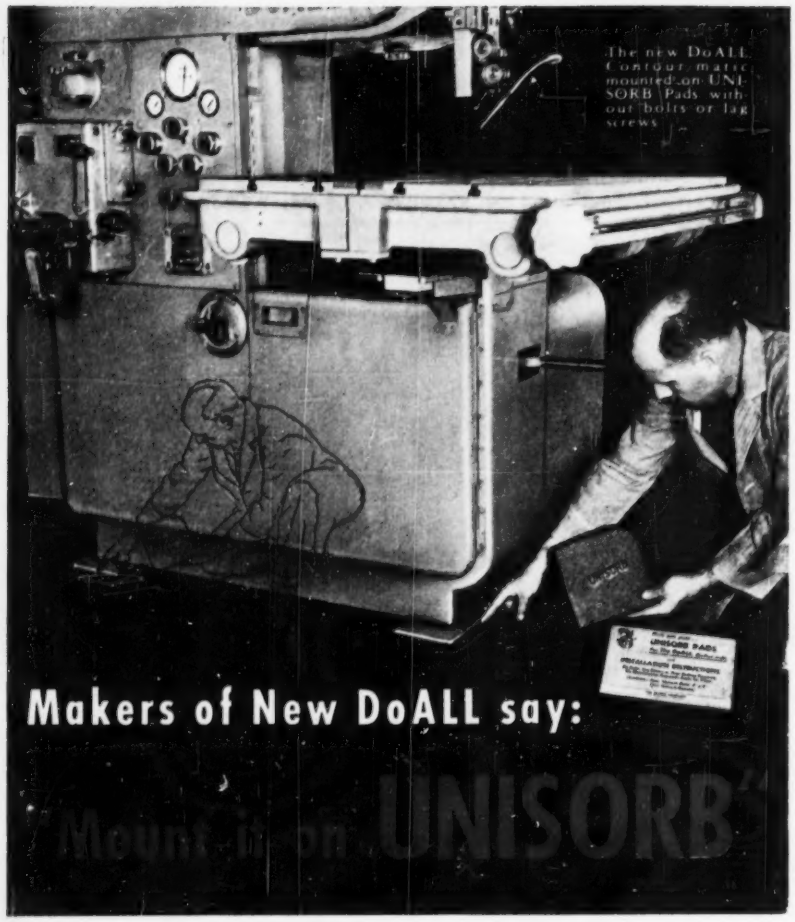
GEAR PRODUCTION HEADQUARTERS

MICHIGAN TOOL COMPANY — from blank to finished gear — COMPLETE EQUIPMENT

7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U. S. A.

COMPLETE EQUIPMENT for GEAR PRODUCTION
Cutting
Finishing
Checking

Shown here is only a part of Michigan's complete line


The new DoALL Contour-matic mounted on UNISORB Pads without bolts or lag screws
Makers of New DoALL say:
Mount it on UNISORB

Yes, specifications for the amazing new DoALL Contour-matic cutting machine call for UNISORB-mounting.

And what could be more natural than to anchor this modern machine the modern way? For UNISORB controls up to 85% of all transmitted noise and vibration.

No drilling or old fashioned floor damage is necessary either. Unisorb cement binds the Unisorb Pads to machine feet and floor with a minimum holding strength of 1500 lbs. per square foot.

Not affected by oil or grease, UNISORB lasts for years and years *with no maintenance!*

THE FELTERS COMPANY

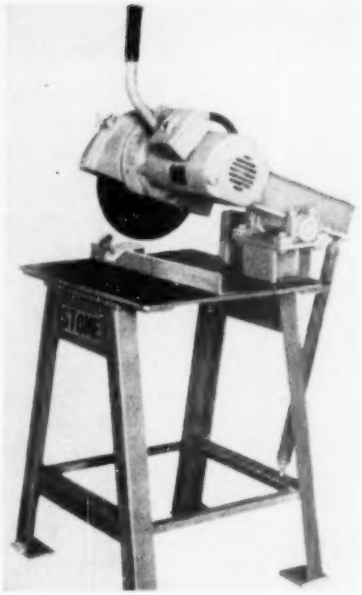
200 SOUTH STREET, BOSTON 11, MASS.

Offices: New York, Philadelphia, Chicago, Detroit, St. Louis
Sales Representative: San Francisco

Makers of FELTS in all colors, thicknesses, consistencies, qualities . . . for all purposes. Rolls, strips, sheets and precision cut felt parts.

Gentlemen: Please send my free copy of "Why It Pays to Anchor Your Machinery with UNISORB."

NAME ..... TITLE .....
COMPANY NAME .....
STREET .....
CITY ..... STATE .....

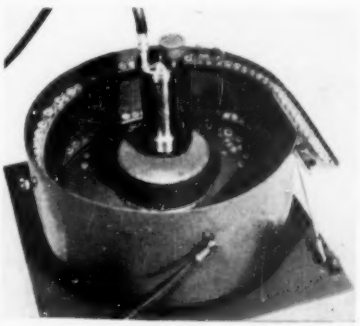


Low-cost Cutoff Machine With Geared-in-Head Motor

Stone Model M-35 cutoff machine is equipped with full 3½-hp geared-in-head motor to permit delivery of full power to the cutting edge. Machine uses a 12-in. abrasive wheel for cutting ferrous metals and a 12-in. steel saw blade for non-ferrous metals.

Capacity of machine in ferrous is 1½-in. solids, 2½-in.-OD pipe, and 2½-in. structurals. Capacity in non-ferrous metals is 2½-in. solids and 3-in. tubing and extrusions. Price of machine is $445.

Stone Machinery Co, Inc, 601 Fayette St, Manlius, NY



Automatic Small Parts Feeder

Pneumatically operated Model B-18 automatic small parts feeder provides oriented single-file feeding to machining, packaging, assembling, sorting, and counting equipment.

Load of parts is dumped into the 18-in.-dia bowl and fed up spiral track to outlet by action of an air vibrator mounted in center of bowl.

NEW–DIFFERENT

4-POST DRILLER AND TAPPER

26 Individual Machine Operations in one unit!

Once again BAUSH ingenuity and experience of many years has produced an hydraulic automatic multi-spindle machine tool designed specifically to speed production on Tank Engine oil pans.

SPECIFICATIONS:

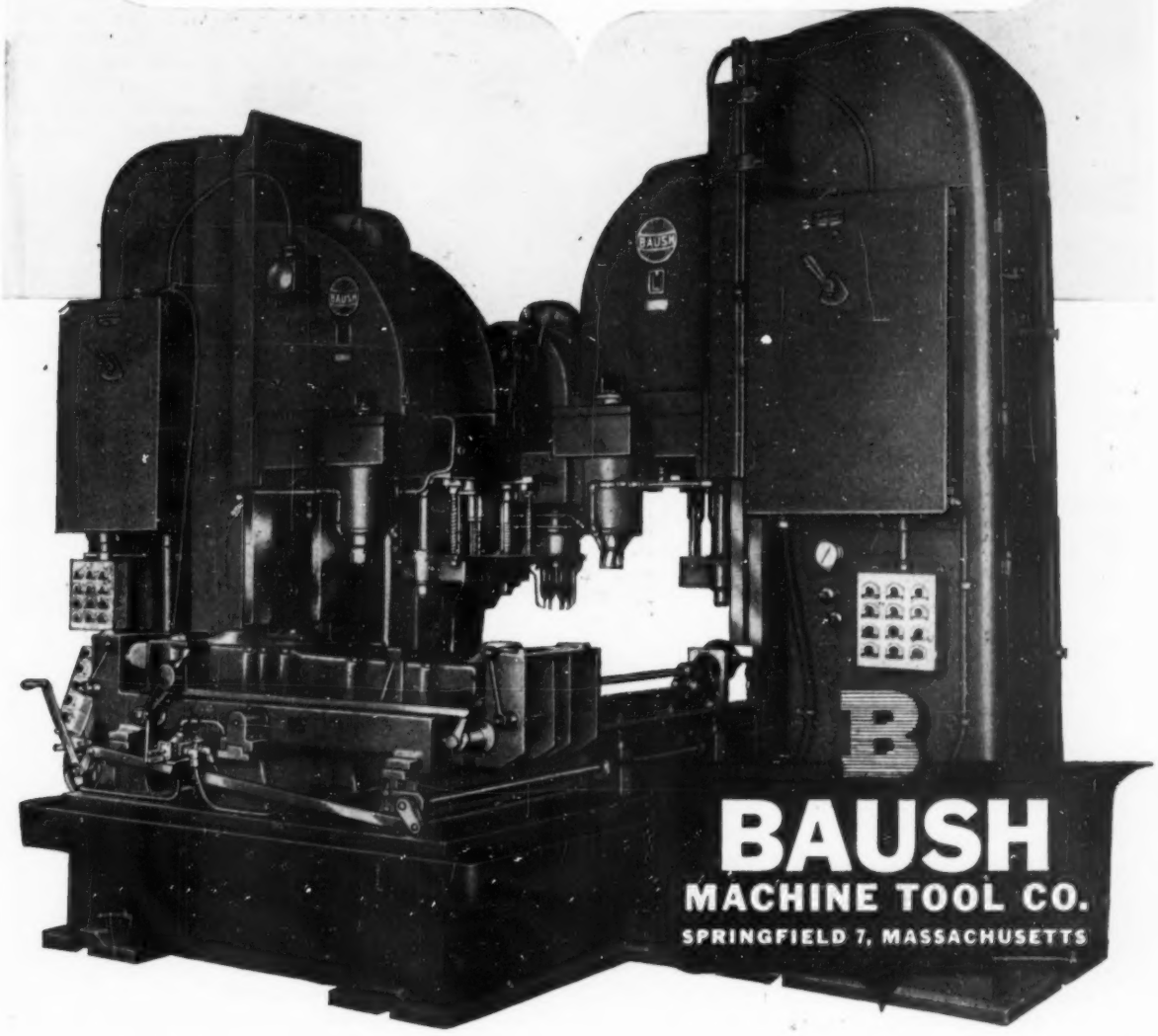
This 4-Way, 4-Post Combination Drilling and Tapping Machine consists of 2 Vertical W-7 Hydraulically operated units. Each unit has a 7 spindle, fixed center, ball-bearing head and two welded steel columns, each with 6 individual lead-screw spindle heads.

Hydraulically operated fixture is a 4-station horizontal duplex set up mounted on large welded steel bed, around which the four vertical machines are built. Steel ways are hardened and ground.

OPERATIONS:

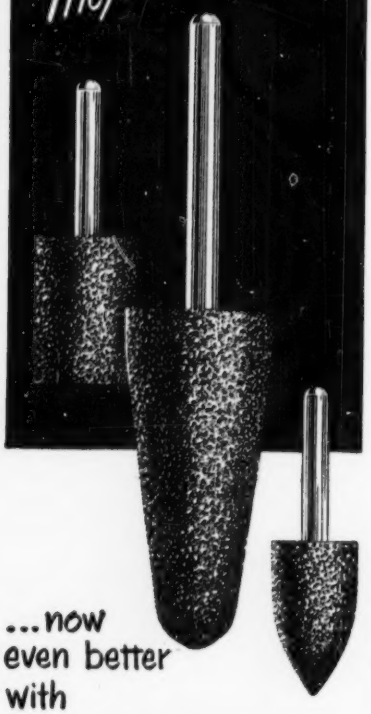
Parts: Tank engine oil pan.
Part lowers into slide with a hoist.

Station 1: Load and unload.
Station 2: Core bore 2 holes.
Station 3: Combination drill and countersink 12 holes.
Station 4: Tap 12 holes.



BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

Chicago
MOUNTED
Wheels
They're the Best



...now
even better
with

79E BOND

the new miracle grinding wheel bond

Choose Chicago Mounted Wheels – bonded with 79E Bond – and you'll never buy any other! This tough new grinding wheel bond, exclusive with Chicago Wheel, has taken the industrial world virtually by storm, doing a better grinding, burring and finishing job faster. Greatest selection of sizes and shapes for every application. Best of all, deliveries are good . . . ready when you need them. Try 79E Bond Mounted Wheels.

WRITE today for full information and literature. It's free.

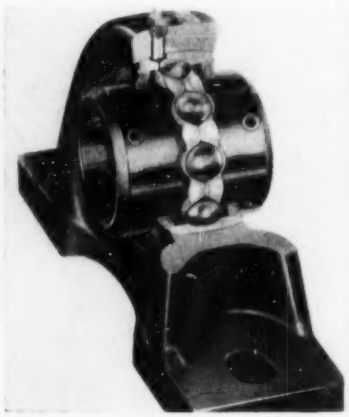
CHICAGO WHEEL
& Mfg. Co.
Dept. A-M. • 1101 West Monroe Street
Chicago 7, Illinois
OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

Feeder is self-cleaning, as convex-shaped bottom directs last part over to start of track. Stalling on track will not damage parts or feeder.

Orientation is accomplished by selectors on track; excess or incorrectly positioned items are diverted back into bowl for recirculation. Variable feeding rate is provided by regulating air pressure. Combination filter-regulator - automatic lubricator is furnished with each unit. Center spring suspension eliminates dampening under load. Feeders can be built to operate clockwise and counter-clockwise with single, double, or multiple-spiral tracks.

Unit weighs 150 lb; max air consumption, 12 cfm at 80 psi; price, $450.

Schlack Mfg Co, 24265 Middlebelt Rd, Farmington, Mich

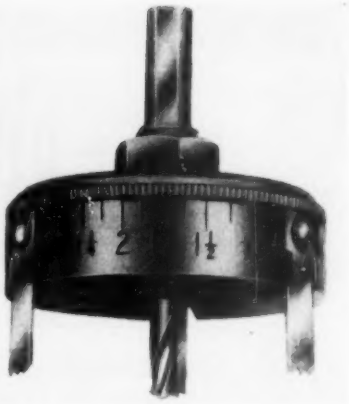


Sealmaster Ball Bearing Units Zone Hardened for Positive Lock

Zone hardened Sealmaster ball bearing units with double extended race are being manufactured by Stephens-Adamson's Sealmaster Div; hardened by a process of induction heat-treating inner race ring of the units through the ball path section only. Since extended portions of the race remain unaffected, hardened threads of the setscrews are able to bind tightly against soft threads of the race for positive race-to-shaft locking. Double extension of inner race ring affords maximum support of bearing on shaft, and guarantees positive lock between inner race of bearing and shaft.

Lock reduces shaft wear and fretting corrosion. Machine downtime is minimized since bearings can be easily removed for replacement, and shafting is not worn and corroded beyond required tolerance for new bearing fit. Shock and vibration resistance are increased.

Stephens-Adamson Mfg Co, Aurora, Ill

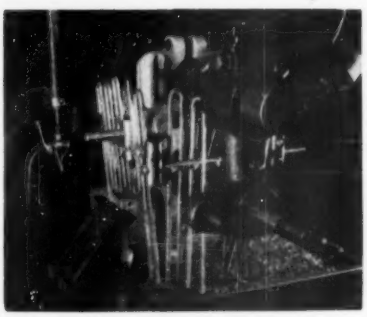


Dial Saw and Rotary Planer Has Triple Adjustment Feature

Dial saw and rotary planer, developed by Erwood, is said to be the first hole saw to incorporate an instantaneous adjustment feature. A twist of the calibrated dial will adjust three sliding blades to cut any size hole from 1⅛ to 2½ in. Tool, which cuts steel, plastics, and other materials, can be used with any ⅜- or ½-in. chuck of power drill or drillpress. Removal of the high-speed steel pilot drill converts the saw into a planer.

Unit is furnished with a set of three molybdenum high-speed steel metal-cutting blades, and a set of wood-cutting blades. Price, $12.95.

Erwood, Inc, 1770 W Berteau Ave, Chicago 13, Ill

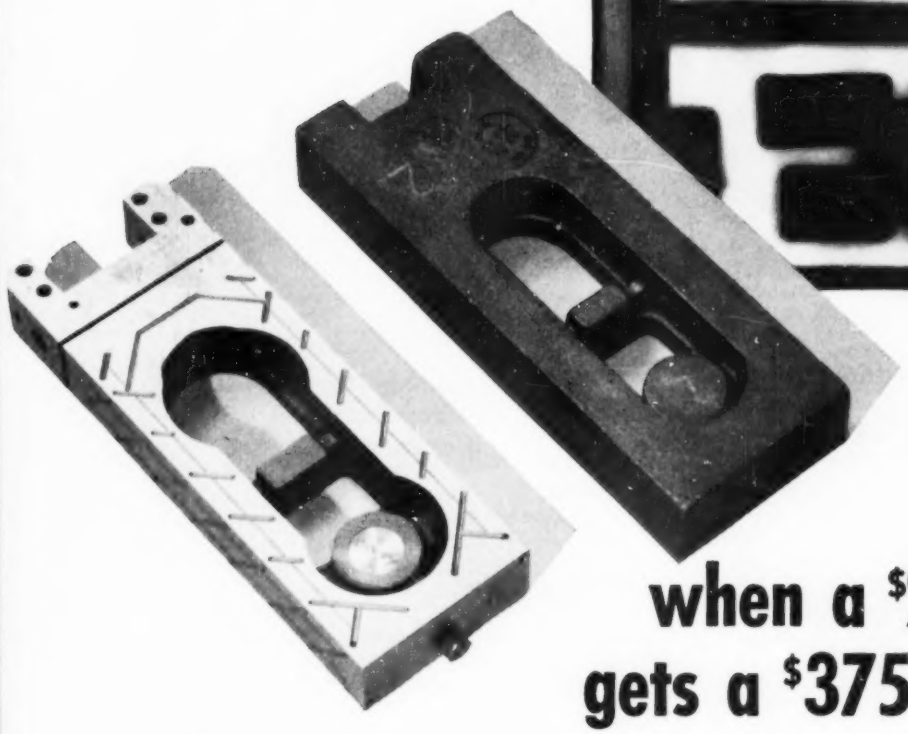


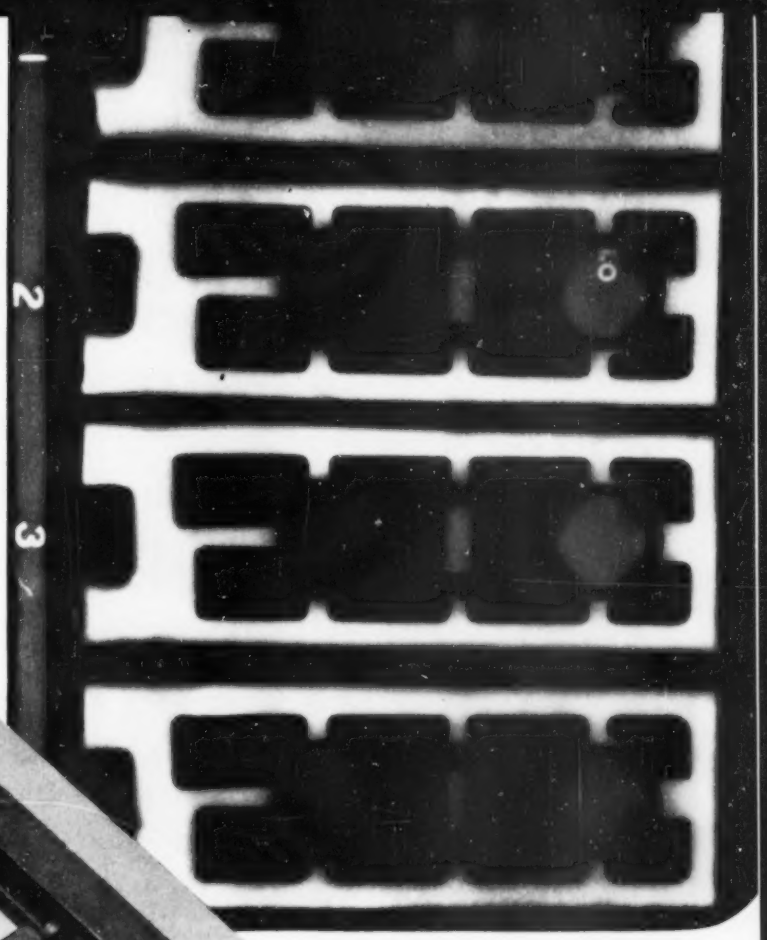
Adjustable Guard Available For All Production Mills

Milling machine guard, designed for all makes and sizes of production mills, consists of vertical hexagon rods placed close together to form a barrier around three sides of rotating cutters. Rods are adjustable for various table settings to just clear work, straps, jigs, and air nozzles; each rod is locked in place by a thumbscrew similar to adjustable basket guards for punch presses.

Guards are easily installed on existing mandrels or over arms by means of two heavy V-block cast-

RADIOGRAPHY prevents waste





Radiograph of an iron casting for a reciprocating ram.

when a $2 casting gets a $375 treatment

This is a casting for a reciprocating ram. It is to be machined and hand scraped to a final flatness of less than .0001 inch. Should porosity show up during machining, the cost of work done and heat treatment is wasted. The part must be scrapped, not scraped.

But radiography avoids that. By x-raying every casting, flaws are discovered before work is started . . . before hundreds of dollars have been invested in machining and heat-treating costs.

This is another example of the savings possible through radiography.

If you'd like to be sure all your castings are sound—if you'd like to know ways to improve yield in production runs—get in touch with your x-ray dealer. He'll gladly talk it over. Or, if you like, write us for a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography . . .

another important function of photography

Kodak
TRADE-MARK

Never Before

SO MANY ADVANTAGES for HIGHEST PRODUCTION

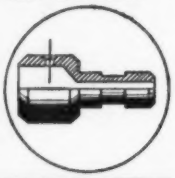
4800 PER HOUR!
3800 PER HOUR!
2500 PER HOUR!

SNOW

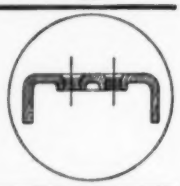
FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

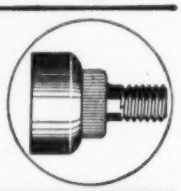
DRILLING
Crossdrill and C"T" Sink 1/16" Hole
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine



TAPPING
Tap Two #10-32 Holes
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine



THREADING
3/8"—24 Thread—1/2" Long
Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

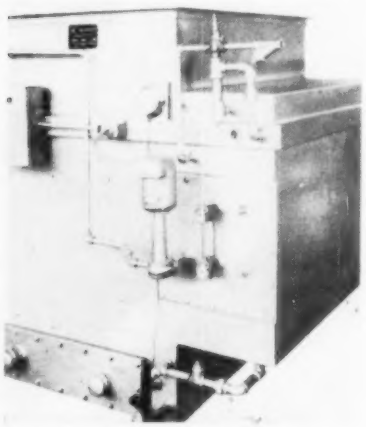
Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

Submit Sample Parts f

SNOW
MANUFACTURING COMPANY
435 Eastern Ave., Bellwood, Illinois
(Chicago Suburb)
Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

ings locked in place wherever desired. No drilling or tapping is required on mills with single or double round mandrel or over arm; can also be mounted on flat or non-round mandrels or over arms. Device can be contracted or expanded to accommodate various jigs, pieces, and cutters. Corner knuckles lock adjustable horizontal round rods by a clamping action which prevents marring or burring. Production is said to be increased because pieces can be changed closer to cutters, and cutters need not be stopped nor mill turned off while changing.

Searjeant Metal Products, 77 Pittsford Rd, Mendon, NY



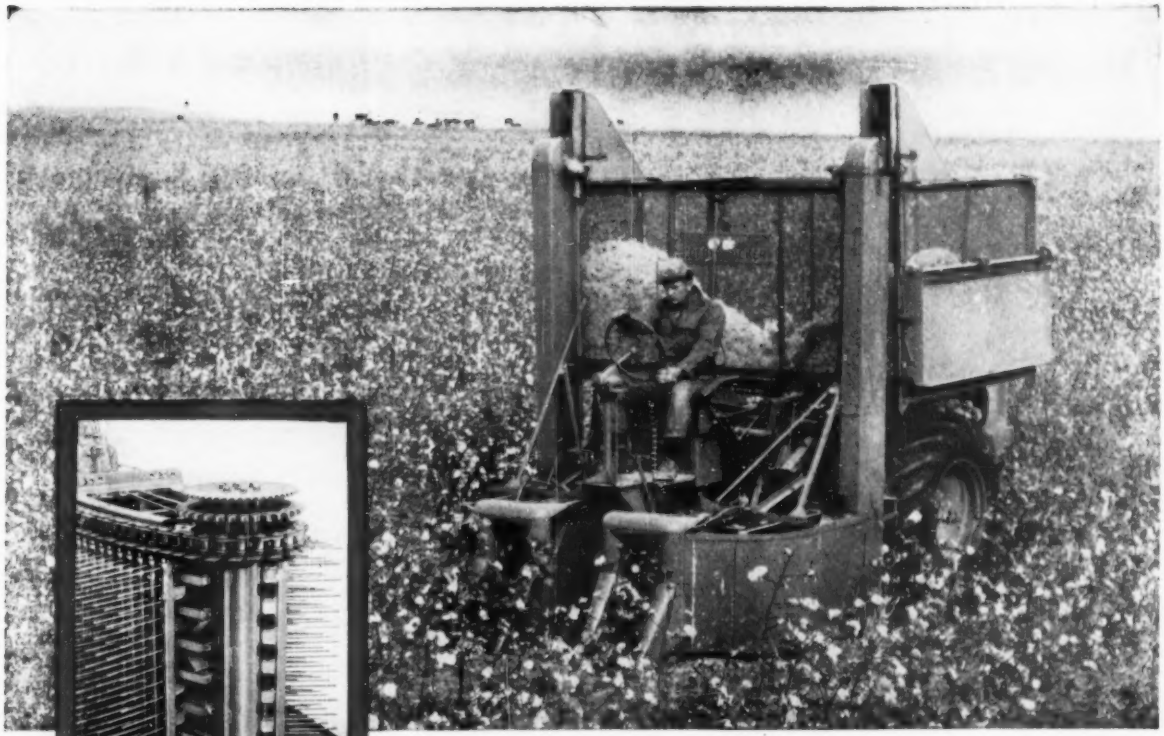
Metalwash Improves Design Of Vapor Degreaser Unit

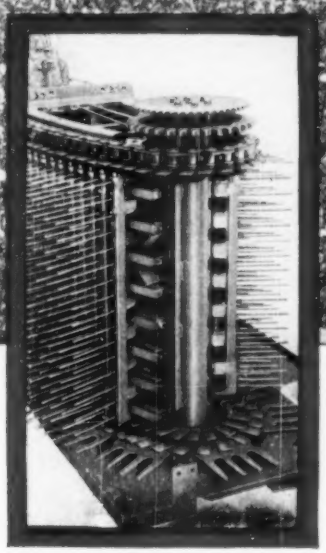
Improved design of the Metalwash vapor degreaser incorporates obstruction-free tank walls, recessed condensing coils, removable pump chamber and water separator made of solid stainless steel, one-end maintenance, and demand-type control of water into condensing system.

Multi-tiered condensing coil, recessed into a back compartment, extends the full length of the unit; solvent condensate trough has been replaced by a large sloped tray, recessed underneath the coil. Water separator and pump compartment are welded to a flanged plate to permit removal for inspection of tank interior; also permits conversion of a straight vapor degreaser to a vapor spray unit, if desired.

Automatic water temperature regulator is so installed that maximum water is required only at times of maximum heat input, when no work is being cleaned. Work introduced results in regulator throttling down so that water use is lowered up to 75%.

Metalwash Machinery Corp, 901 North Ave, Elizabeth 4, NJ





HEAT TREATING MAKES STRONG FINGERS FOR COTTON PICKERS

In the southland there's something new on the horizon . . a mechanical cotton picker. It's quite a machine . . picks two rows at once . . handles acres and acres of cotton in nothing flat compared to slow, laborious hand-picking.

It's intriguing to watch this amazing machine. It has 2,560 *rotating steel fingers* that gently probe the open cotton bolls, and deftly pick out the soft, white cotton fibres.

A few years back when the new cotton picker was in the design and testing stage, the carbon steel fingers . . all 2,560 of them came up for some serious attention. The heat treating *had* to be right. For the "fingers" had to be straight and they had to be hard. Just the right hardness . . not *too* hard or they might snap off, and not too soft or they might bend.

Allis-Chalmers brought their problem to the metallurgical and heat treating research laboratories of Lindberg Steel Treating Co. In a short time, Lindberg heat treating specialists, in cooperation with Allis-Chalmers engineers, developed an effective and successful process. It permitted the heat treating of the carbon steel fingers without scaling . . and without distortion . . to precisely the right physical properties.

Solving problems in heat treating is an everyday experience for Lindberg Steel Treating Company. Some 34 metallurgical engineers and metallurgists with a composite heat treating experience of more than 650 years are available to consult with you on any heat treating problem. Your inquiry is invited.

Plants in

MELROSE PARK, ILL. (Chicago)
1975 North Ruby
FIllmore 4-4080

ROCHESTER, N. Y.
620 Buffalo Rd.
GEnesee 5212

ST. LOUIS
650 E. Taylor
Fireside 6200

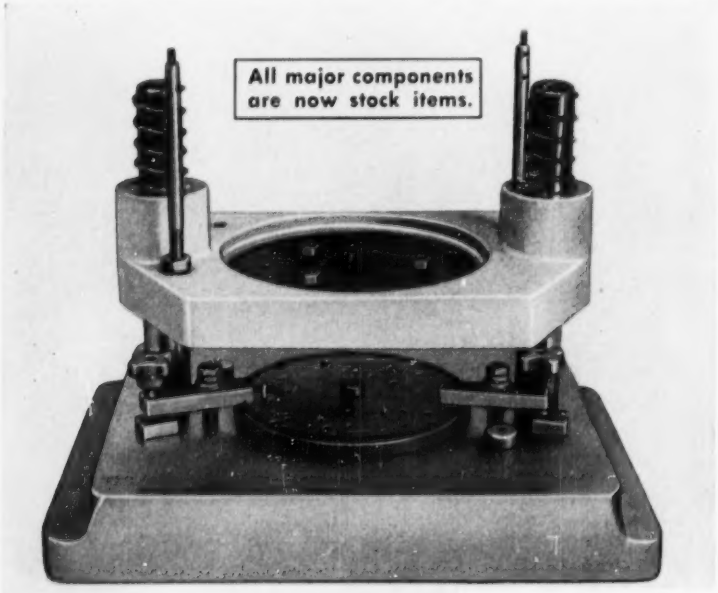
LOS ANGELES
2910 So. Sunol Drive
ANgelus 9-7311

A case history of Lindberg Steel Treating Co. service to American industry

LINDBERG STEEL TREATING CO.

1933 North Ruby Street, Melrose Park (Chicago), Illinois Phone: FIllmore 4-4080

HERE'S THE NEW Zagar Standardized Self-Clamping DRILL JIG

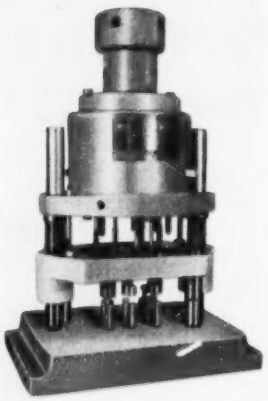


Zagar Drill Jigs are used in conjunction with Zagar gearless multiple-spindle drill heads to ream, drill and tap on standard drill presses and tapping machines.

NOTHING ELSE LIKE IT!

4 TYPES — 9 SIZES,
5 COMBINATIONS PER SIZE —
Hole Patterns 3" through 15" Dia.

SPEEDY — ACCURATE — RUGGED



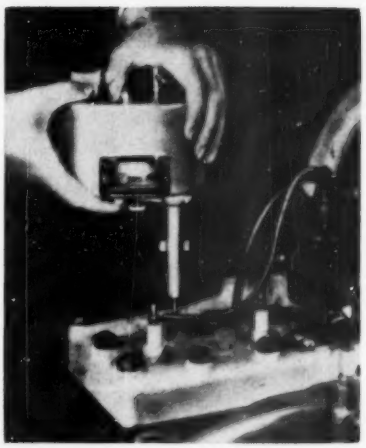
▲ *Zagar 15-spindle, 7" diameter gearless drill head mounted on Zagar standardized drill jig drills 15 holes in aircraft part.*

A new concept to reach new production highs! Standardization means quick delivery and attractive price, since only a very few minor parts have to be made. Extremely fast; the operator merely feeds the parts — the Zagar Self-clamping Drill Jig does the rest. Proven design insures maximum accuracy.

ASK FOR OUR NEW DATA SHEET "A-12".

ZAGAR TOOL, INC. 24000 LAKELAND BLVD., CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY



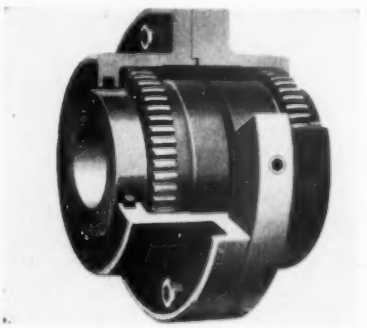
Vibration Measuring Instrument Has Variety of Applications

Askania hand vibrograph, manufactured in Germany, is a compact 3¾-lb instrument developed for measuring mechanical vibrations on machinery of all kinds, shafts, cables, and springs.

It is built for a frequency range from 0 to 250 cps, and for accelerations up to 50 G. Unit is driven by its own clock work; time markers are operated by a built-in 6-v battery. Uses no ink; records by stylus on a transparent wax-paper tape. Amplitude range is from 0.00001 up to ⅜ in.

Variety of available accessories enables it to be used not only to measure longitudinal vibrations, but also torsional vibrations on shafts, and pressure vibrations on liquid or gas-carrying pipes.

Imported by Epic, Inc, 154 Nassau St, New York 38, NY

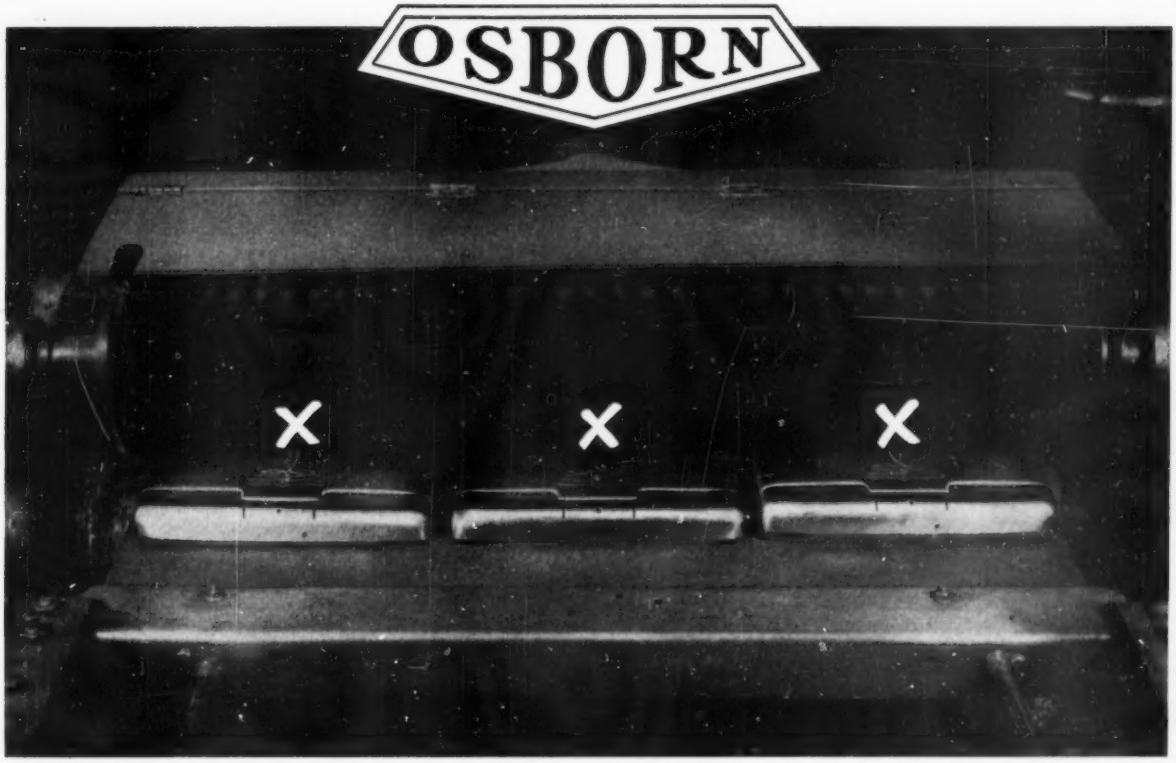


Geared Flexible Couplings Have Light Weight and High Capacity

Line of lightweight geared flexible couplings for high speed and high torque applications has been introduced by Link-Belt.

Two-section, free-floating housing has internally cut gear teeth. Sections are rabbet-fitted and bolted to-

OSBORN



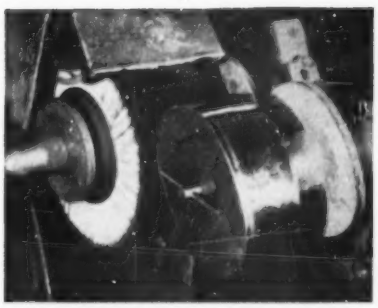
X unmarks the spot...at 1750 rpm

Heavy Presses form these waffle iron lids. But they leave draw marks on the cold rolled steel . . . marks which must be removed before the lids take their nickel plating bath.

That's when the Osborn Fascut® brushing sections go to work for this appliance manufacturer. Under those waffle-iron panels are wooden forms, attached to the table which moves the panels back and forth under the rotating (1750 rpm) Fascut brushes. A flexible back-up roll regulates the pressure during brushing.

Not only do the Fascut brushes blend away the draw marks quickly... but the panels are also finished at the same time. This eliminates a time-consuming hand-finishing operation. Now the manufacturer produces 250 panels an hour, *twice the output* before the Osborn Fascut brushing sections were adopted.

Whatever *your* product . . . metal, rubber, plastic or other material . . . it will pay you to have your **O**sborn **B**rushing **A**nalyst study your operations to suggest the money- and time-saving techniques made possible by Osborn power brushing methods. Call or write *The Osborn Manufacturing Company, Dept. C-13, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



300% greater wear is obtained from the Osborn Monarch Brushes used here than with the Tampico brushes used previously. In this push-button brushing operation, a smooth lustrous finish is produced prior to nickel plating.

FREE:
New booklet on deburring with Osborn Power Brushing. Write for your copy.

Osborn Brushes

OSBORN BRUSHING METHODS • POWER, MAINTENANCE AND PAINT BRUSHES • BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

need a better finish?

Torrington Swaging Machines – delivering 4000 hammer blows a minute – work out surface imperfections quickly... produce a finish far superior to that obtained by other reduction methods. Swaging improves the quality of the material, too, and utilizes every ounce of stock.

"The Torrington Swaging Machine" describes all the advantages of swaging and gives full details on all Torrington machines. A copy is yours for the asking.

THE TORRINGTON COMPANY
Specialty Department
553 Field Street • Torrington, Conn.
Makers of
TORRINGTON NEEDLE BEARINGS

gether to function as a single, rigid unit, forming a dust-proof, lubricant-retaining enclosure. Wide face of internal gear teeth provides for end float of connecting shafts while maintaining full tooth contact. Externally cut gear teeth of hubs are machined to provide constant clearance at root of internal teeth of housing, thus accommodating reasonable misalignment.

Ten standard sizes are available with bores ranging from 1 to 6 in. and with hp rating at 100 rpm ranging from 2 to 450. Hubs bored for either slip or shrink fit on shaft can be furnished.

Link-Belt Co, 307 N Michigan Ave, Chicago 1, Ill

Versatile Comparator Developed For Assembly Line Checking Work

Lightweight mechanical comparator, called Producto-Chek, has been designed for assembly line checking operations.

Three adjustments permit rapid size settings. Leadscrew on the column provides coarse adjustment and facilitates rapid rough positioning of the gaging head. There are two fine adjustments; one, a thumbscrew type, moves gaging head slightly up or down; the other is a lever by which dial scale is moved from left to right for minute zeroing movements, or for setting the scale off zero to compensate for known errors in masters.

Gaging head has a double reed amplifying system which eliminates use of gear trains, levers, racks, pinions. System makes the unit self-compensating at temperature, to maintain linearity of calibration over a wide temperature range. Measuring pressure of the spindle is factory-

need information on

turning machines?

reach for Machine Tool Catalogs

"... a great time-saver"

These manufacturers' catalogs are instantly available in Section 3 of your Machine Tool Catalogs:

Bullard Co.	New Britain Machine Co.
Cincinnati Lathe & Tool Co.	Gridley Machine Div.
Cone Automatic Machine Co.	Rivett Lathe & Grinder, Inc.
Gisholt Machine Co.	Seneca Falls Machine Co.
Greenlee Bros. & Co.	Sheldon Machine Co., Inc.
Jones & Lamson Machine Co.	Sidney Machine Tool Co.
R. K. LeBlond Machine Tool Co.	Troglia Fratelli, Sas
Monarch Machine Tool Co.	Turchan Follower Machine Co.
Nebel Machine Tool Co.	Wade Tool Co.
	Warner & Swasey Co.

***ALSO:* The following catalogs, in other sections of your Machine Tool Catalogs, contain information on turning machinery.**

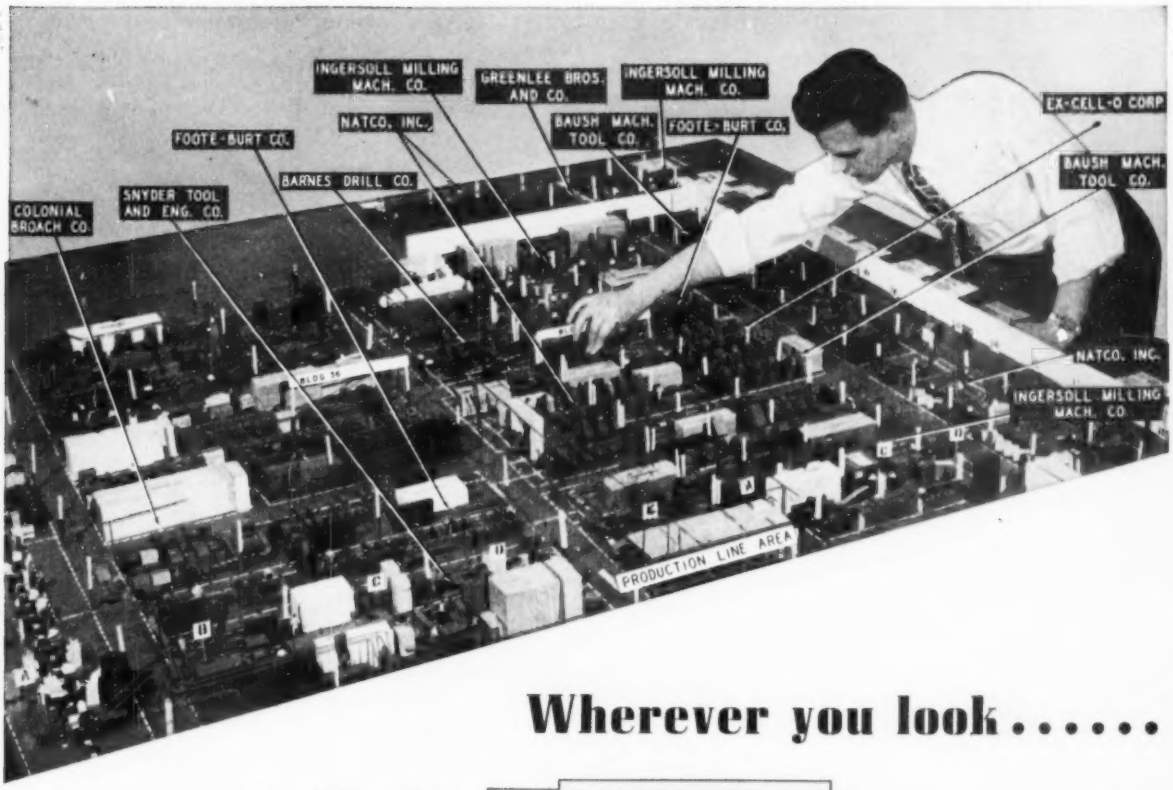
Armstrong Bros. Tool Co.	Motch & Merryweather Machinery Co.
Besly-Welles Corp.	Norton Co.
Brown & Sharpe Mfg. Co.	Plan-O-Mill Corp.
Bryant Chucking Grinder Co.	Sheffield Corp.
Consolidated Machine Tool Corp.	Sundstrand Machine Tool Co.
Dake Engine Co.	Taft-Peirce Mfg. Co.
Hall Planetary Co.	Thomas Machine Mfg. Co.
Landis Tool Co.	Wales-Strippit Corp.

In other sections of the File you will find additional catalogs containing useful information on a wide range of machine tools and accessories.

Sweet's Catalog Service

Division of
F. W. Dodge Corporation
119 West 40th Street, New York 18, N. Y.

In this Modern Automobile Engine Plant



Wherever you look.....

you'll see VICKERS® HYDRAULICS

Here is a scale model of the production line area of one of the most modern automobile engine plants ever built. Having a capacity of 100 V8 engines per hour, it is equipped with time-and-money-saving machinery for automation.

Wherever you look in this plant you'll see Vickers Hydraulics. This is indicated on the photograph by the lines leading out from the Vickers-equipped machines to the names of their makers. It is an interesting study . . . first for the variety of machines . . . second for the large number of builders who use Vickers Hydraulics. Vickers Hydraulics is often the ideal solution to the myriad problems of feed, control, transfer, synchronization, etc. which must be dealt with in a highly automatized plant such as this. Hydraulic power can be developed wherever most convenient and applied at any other location. Simplification of design, flexibility of control, instantaneous response, rapid operation, ease of providing interlocks and overload protection, low maintenance . . . all are characteristics of Vickers Hydraulic Systems.

Do your machines have Vickers Hydraulics? The Vickers Application Engineer near you will be glad to discuss the many advantages.

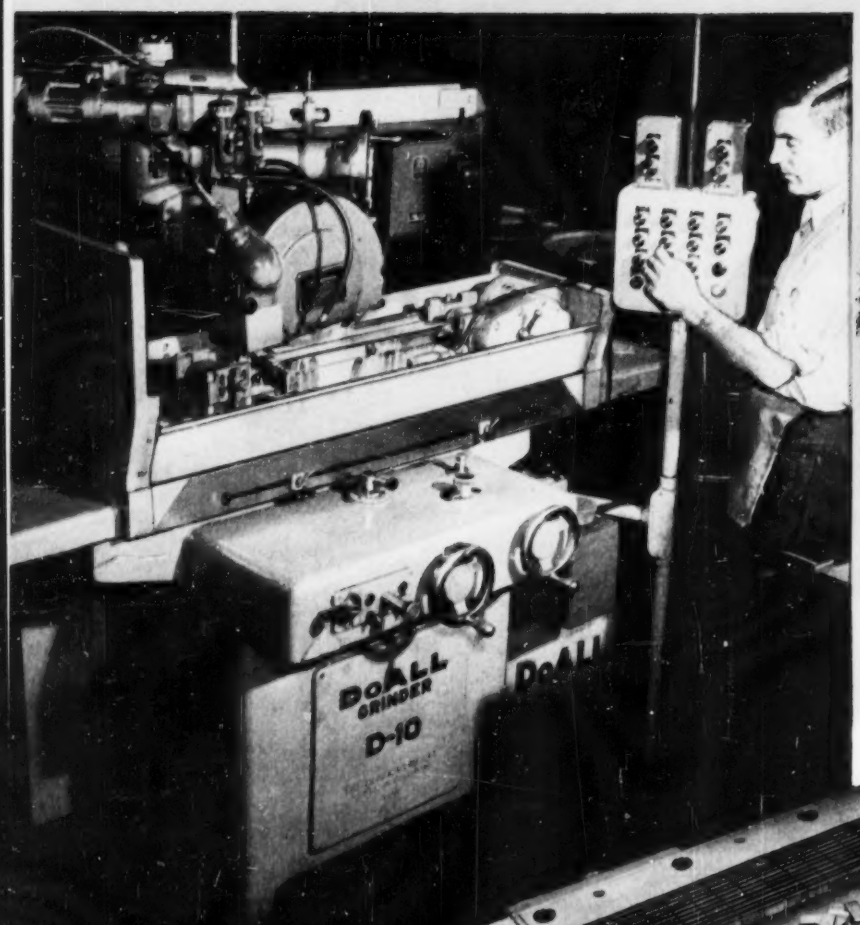
6445

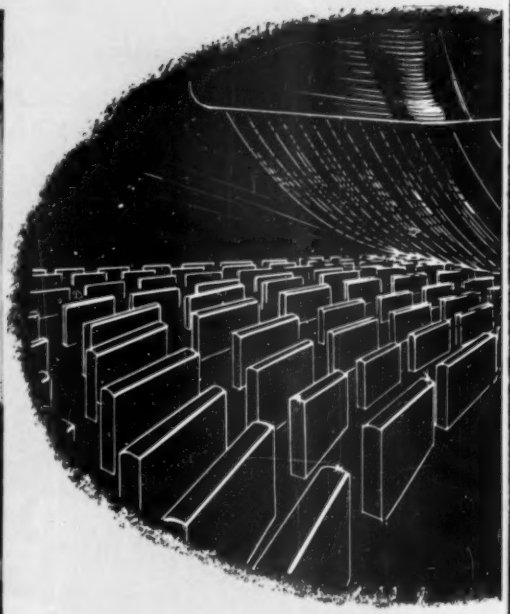
VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
1410 OAKMAN BLVD. • DETROIT 32, MICH.

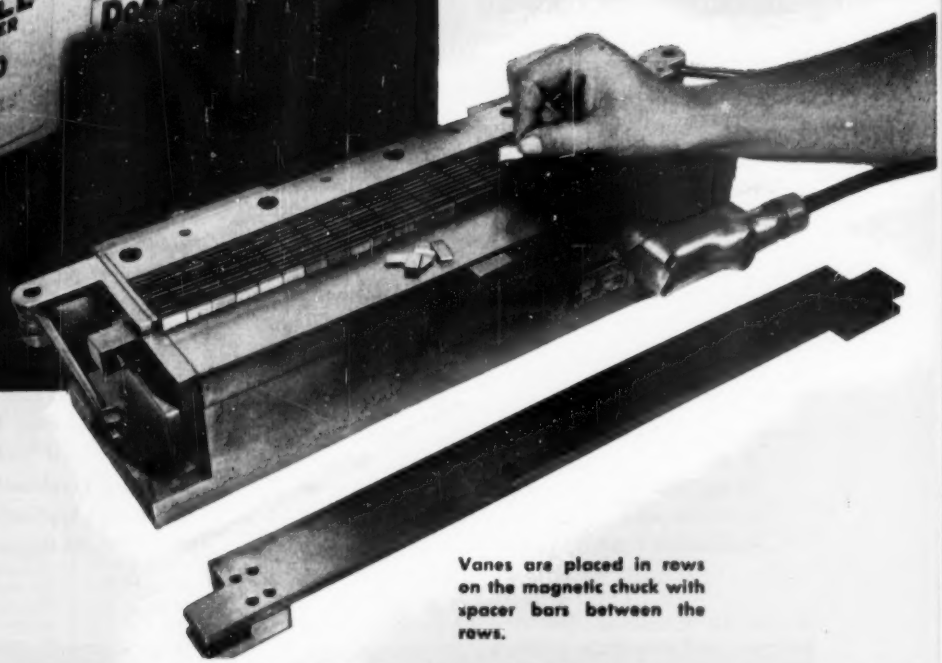
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Application Engineering Offices: **ATLANTA • CHICAGO (Metropolitan) • CINCINNATI • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES (Metropolitan) NEW YORK (Metropolitan) • PHILADELPHIA (Metropolitan) • PITTSBURGH • ROCHESTER • ROCKFORD • SEATTLE • TULSA • WASHINGTON • WORCESTER**

FORM GRINDING for

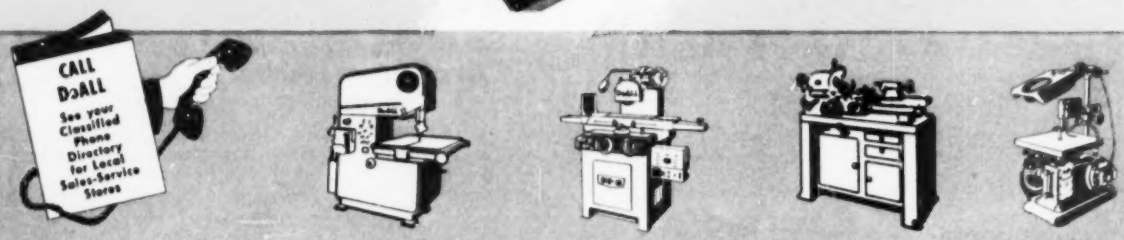






Above — DoALL Model D-10 Grinder. Once the controls are set, the grinder operates automatically until the job is finished. Form grinding attachment provides table speeds from one inch to 75 feet per minute. Combination "Cool-Grinding" and flood cooling permits heavier cuts without burning work. Remote electric control panel simplifies operation.

Vanes are placed in rows on the magnetic chuck with spacer bars between the rows.



MACHINE TOOLS

POWER STEERING

GRINDING TO A PROFILE — The wheel is crush dressed to a profile to give the desired contour to the parts. Radii are precision ground on these tiny pump vanes at a rate of 1150 per hour.

The performance of power steering depends on the precision of its parts.

OPERATION: Automatic grinding to form .09" (±.03") radius on power steering pump vanes.

MACHINE: DoALL Automatic Precision Surface Grinder.

PART SIZE: .6136" x .343" x .0775".

DOWNFEED: .0005" per pass.

TABLE SPEED: 40 fpm.

COOLING: Combination flood and "Cool-Grinding"* with high detergent soluble oil.

PRODUCTION: 1150 pieces per hour.

SURFACE FINISH: 10 to 15 micro-inches RMS, free of checks or cracks.

*In DoALL "Cool-Grinding" (U.S. Pat. No. 2470350), coolant flows through the wheel and out at point of contact with the work. Standard wheels are used.

DoALL Precision Surface Grinders Form Radii on Pump Vanes; Surface Finish 10 to 15 Micro-inches; Production 1150 pieces per hour

FORM GRINDING is a real test of a surface grinder! The loads imposed on the machine during crush dressing of the wheel are more than ten times as great as those imposed by straight surface grinding. Additionally, grinding of irregular contours creates axial as well as radial loads on the wheel and spindle. Close tolerances, fine finish and high production require great rigidity and accuracy of all grinder parts.

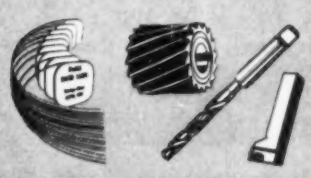
The operation described here is real proof of the rigidity and accuracy built into DoALL Precision Grinders. It is ample evidence that no grinder excels a DoALL. It is your assurance that a DoALL will more than meet your toughest requirements.

Ask for 20-page catalog describing DoALL design, "Cool-Grinding*," automatic operation, remote control, plunge grinding and many other extras of this great new line of grinders . . . 6" x 18", 6" x 24", 8" x 24" and 10" x 30" sizes. Better yet, ask for a free demonstration in your own plant. Call your local DoALL Sales-Service Store, or write:

GR-13

The DoALL Company, Des Plaines, Illinois

DoALL

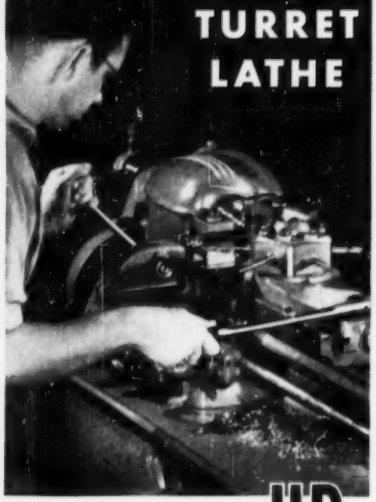


CUTTING TOOLS

GAGING EQUIPMENT

METAL WORKING SUPPLIES

SOUTH BEND 900 TURRET LATHE



KEEPS PRODUCTION UP AND COSTS DOWN

Here's a precision turret lathe that will help you increase production and reduce costs on precision parts. High output comes easy on the Series 900 South Bend Turret Lathe. It's quick and easy to operate. A wide range of speeds and power carriage feeds contribute to efficient machining. Close tolerances can be held without sacrificing speed. These features make the Series 900 Turret Lathe ideal for second operation work. If you are producing small precision parts, it will pay you to find out more about South Bend Turret Lathes which are made in three sizes: ½" to 1" collet capacity, 9" to 16" swing. Write for catalog on Engine Lathes, Toolroom Lathes, Drill Presses and Shapers.

SPECIFICATIONS

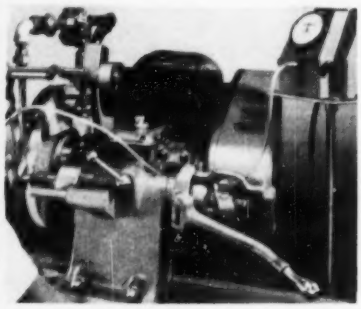
Collet Capacity: ½". Spindle Bore: ¾". Swing: 9¼" over bed, 3⅝" over double tool cross slide, 5½" over compound cross slide. Turret to Spindle Distance: 20⅜". Twelve Spindle Speeds: 41 to 1270 r.p.m. 48 Power Longitudinal Feeds. 48 Power Cross-feeds. 48 Thread Cutting Pitches R.H. or L.H. 4 to 224 per inch.

SOUTH BEND LATHE
Building Better Tools Since 1906
SOUTH BEND 22, INDIANA

set and is low but constant, permitting use of both hands. Column can be rotated on the base, allowing instrument to be used with a surface plate or master flat lying adjacent.

Comparator is available in several ranges in both English and metric calibrations. Gaging heads are interchangeable on the stand, and may be purchased separately. Special spindle tips and complete accessory kit are available for increasing diversity of application.

The DoAll Co, 254 N Laurel Ave, Des Plaines, Ill

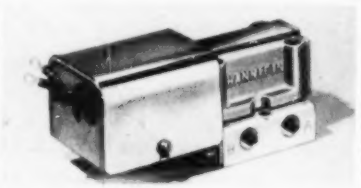


Federal Arnold Grinding Gage Equipped with Dial Indicator

Arnoldair Model A-77 is a high-magnification air attachment for use in production of cylindrically ground work to consistent close tolerance.

Regular Arnold grinding gage is provided with a dial indicator which contacts a plunger riding continuously on the part. By observing the indicator, operator can see exact size of the part at any time during grinding operation. Unit eliminates flicker of the indicator hand, caused by roughness of part, by cushioning the effect of minute roughness of work surface. Where a large amount of stock is left for finish grind, indicator gives operator ample time to adjust rate of infeed to approach final size.

Federal Products Corp, 1144 Eddy St, Providence 1, RI



Direct Solenoid Operated Valves Available in Two ¼-in. Models

Two ¼-in. 4-way poppet-type valves have been added to the P-M line. Models CC1-25 and CC11-25 are direct solenoid operated, extremely

FORMING FACTS

72% SAVING IN METAL!

80% INCREASE IN PRODUCTION!

UNIQUE BALANCE CO., INC.

typical results by every user of

NILSON 4-SLIDE

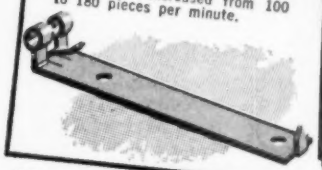
Wire and Ribbon Metal

FORMING MACHINES

You, too, can enjoy tremendous economies **at once.** NILSON combination press and 4-slide forming machines take the stock directly from the coil — feed, straighten, pierce, blank, swage, stamp, coin — perform up to 5 forming operations and cut off . . . all in one quick, precise operation AUTOMATICALLY!

USING A NILSON COMBINATION PRESS AND 4-SLIDE FORMING MACHINE,

Unique Balance Co., Inc. (one of the largest manufacturers of sash balance equipment), now produces 71,532 more parts out of the same amount of steel, compared to their former method. Production speeds increased from 100 to 180 pieces per minute.



For specific recommendations, send prints or samples of your operation when requesting bulletin.

THERE'S **NILSON**

THE A. H. NILSON MACHINE CO.
1519 Railroad Ave., Bridgeport, Conn.

Automatic Chain-Making Machines • Automatic Staple Forming Machines • Wire and Stock Reels • Foot Presses • Wire Straightening Equipment • Slide Feeds for Presses

here it is!

new HYDRAULIC THREAD MILLING MACHINE

Check These Outstanding Features

- Hydraulic-driven cutter and work spindles.
- Rapid traverse carriage.
- Variable cutter speeds up to 3000 r.p.m.
- Permits use of carbide cutters where applicable.
- Lead cams and cross-feed cams.
- Semi-automatic operating cycles.

. . . a new *Hanson* process that permits maximum operation efficiency under the widest possible range of conditions.

Simply by turning a dial, *even during operation,* operator can adjust machine to *coordinate* all machining elements.

As a result, production rates can be increased and maintained, and cutter life can be considerably increased.

Manufactured in the following capacities: 4" x 9", 8" x 16", 10" x 24", 15" x 30". Longer beds and larger swings to suit customers' requirements.

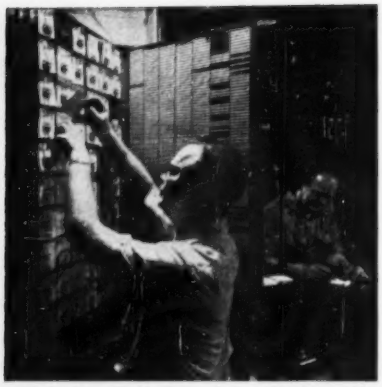
If you have a threading problem, the "Hanson Process" will offer you the most economical solution. Investigate today!

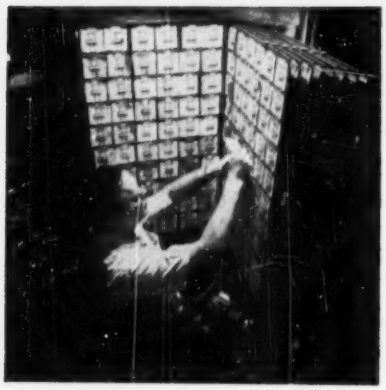
the HANSON
Threading Processes Offer Complete Coordinated Responsibility
The Machine Tools
The Cutting Tools
The Measuring Gages

Engineered, Produced and Sold by the
HANSON-WHITNEY DIVISION of the WHITNEY CHAIN CO.
160 Bartholomew Avenue Hartford 2, Connecticut, U. S. A.

THREAD MILLING MACHINES • SMALL TOOLS • GAGES

10HW88A





McCaskey Tool Control in Winslow Mfg. crib serving production of tools, dies, jigs, fixtures and experimental work.

WINSLOW MFG. CO. reports their McCASKEY TOOL CONTROL *a dividend-paying investment*

Mr. J. A. Price, Gen. Mgr., Winslow Manufacturing Co., Cleveland, O., high-spots results of their investment in McCaskey Tool Control as follows:

"Substantial monthly dividends are earned (1) by instantly providing a dozen or more facts about tools and tooling essential to efficient and economical crib and shop operation, (2) by eliminating non-productive man and machine time that thrives on uncontrolled crib service, (3) by reducing and conserving tool purchases and (4) by minimizing crib overhead.

"Our plant and organization have grown considerably since McCaskey Control was adopted in November 1951 with an experienced, competent manager in charge of the crib. We all feel that McCaskey has proved to be a productive and profitable investment."

McCaskey Tool Crib Control . . . and other Industrial Control Systems . . . will pay similar dividends in your plant, large or small. Write us for complete information. No obligation, of course.

MAIL COUPON TODAY

McCASKEY REGISTER DIVISION
Victor Adding Machine Co.
ALLIANCE, OHIO

Please send me McCaskey Tool Control procedure and factual reports from representative users.

Name .....

Position .....

Company .....

Address .....

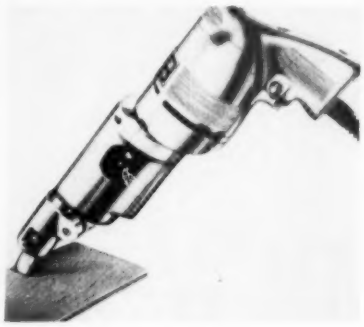
Printed in U.S.A. A-584

McCaskey
INDUSTRIAL CONTROLS
PRODUCTION - INVENTORY
TOOLS - MAINTENANCE - COSTS
THE McCASKEY REGISTER DIV.,
Victor Adding Machine Co.
ALLIANCE, OHIO
Galt, Canada Watford, England

compact and simple, and recommended for speeds as high as 600 cycles per minute. Principal use is expected to be for electric control of small, double-acting air cylinders on short-stroke, high-speed applications.

Single-solenoid Model CC1-25's single valve-stem, which is the only moving part, is spring returned. Model CC11-25 has two solenoids, and its single valve stem remains at either end of its short stroke until the other solenoid is momentarily energized to return it. This makes momentary contact operation possible, eliminating necessity, with a single-solenoid valve, of keeping it energized as long as it may be desired to hold valve in its shifted position. Pipe or tubing connections are made to a separate manifold, to which the valve mounts. Body and solenoids can be removed for servicing by means of four cap screws, without disturbing line connections. Available, optionally, tapped for $\frac{3}{8}$-in. pipe or tubing connections at no extra cost.

Hannifin Corp, 1118 S Kilbourn Ave, Chicago 24, Ill



Portable Drill Attachment

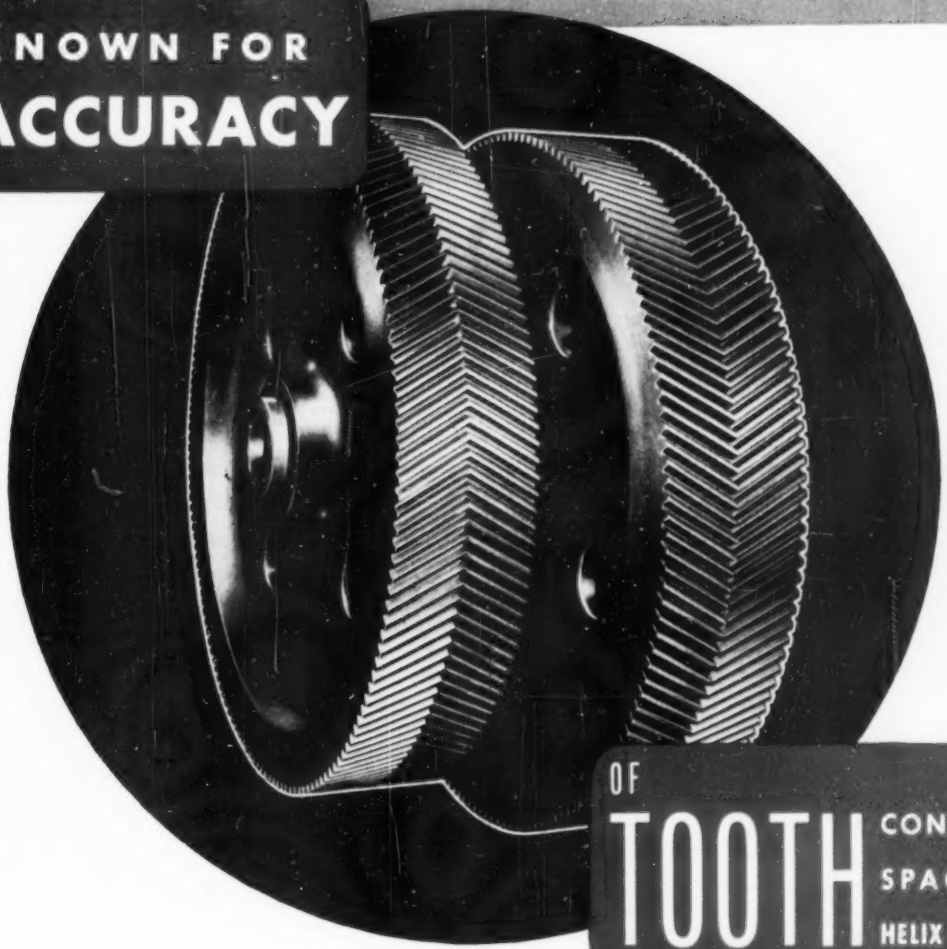
E-Z Cut drill attachment for $\frac{1}{4}$-in. portable electric drills locks rigidly to housing nose and converts drill into a power saw which can be used for heavy-duty work on all metals, plastics, and other materials. Other cutting tools include chisels, gouges, jig-saw and jig-saw tables, files, and rasps.

Attachment can be installed and removed easily without special tools or alteration of drill; operates on ball bearings, delivering power without vibration or overloading of drill. Choice of adapter rings makes it suitable for most standard-duty drills with 1700 to 3000 rpm and an amperage power rating of 1.7 or more. Jig-saw table converts hand drill into a power jig-saw with no throat or other obstacle to limit size or shape of work.

Jaco Devices, Inc, 90 High St, Hingham, Mass

PHILADELPHIA HERRINGBONE GEARS

KNOWN FOR ACCURACY



OF TOOTH CONTOUR SPACING HELIX ANGLE

Continuous tooth construction gives great load carrying capacity with a smooth flow of power. Made by Philadelphia, their high quality results from selected materials, controlled manufacture and careful inspection.

Philadelphia Continuous Tooth Herringbone gears are available in sizes up to 60" diameter, 18" face.

For full information send for our Gear Catalog.

Philadelphia Gears

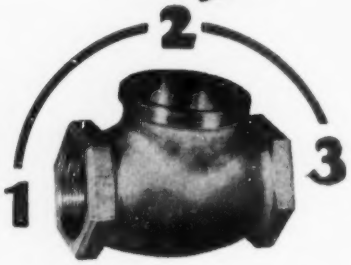
Philadelphia Gear Works, INC.

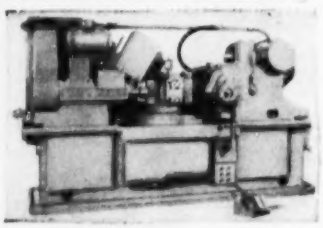
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK · PITTSBURGH · CHICAGO · HOUSTON · LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

Single set-up covering
ALL finishing operations...
MEANS
GREATER ACCURACY
with
GOSS DeLEEUW





AUTOMATIC
CHUCKING
MACHINES

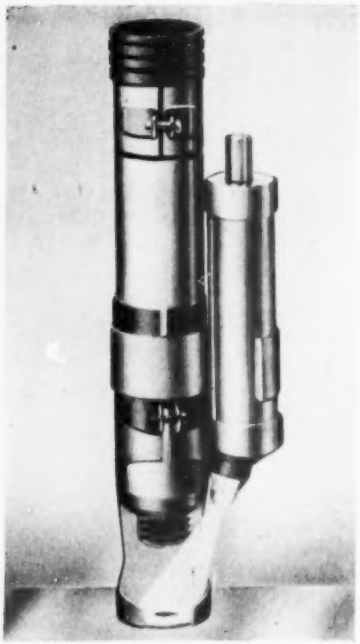
One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & DeLeeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & DeLeeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.



Brinell Microscope-Reader Determines Metal Hardness

Brinell microscope-reader for measurement of the diameters of indentations made by the ball indentors of all Brinell-type hardness testing machines, can also be used to test the accuracy of the machine.

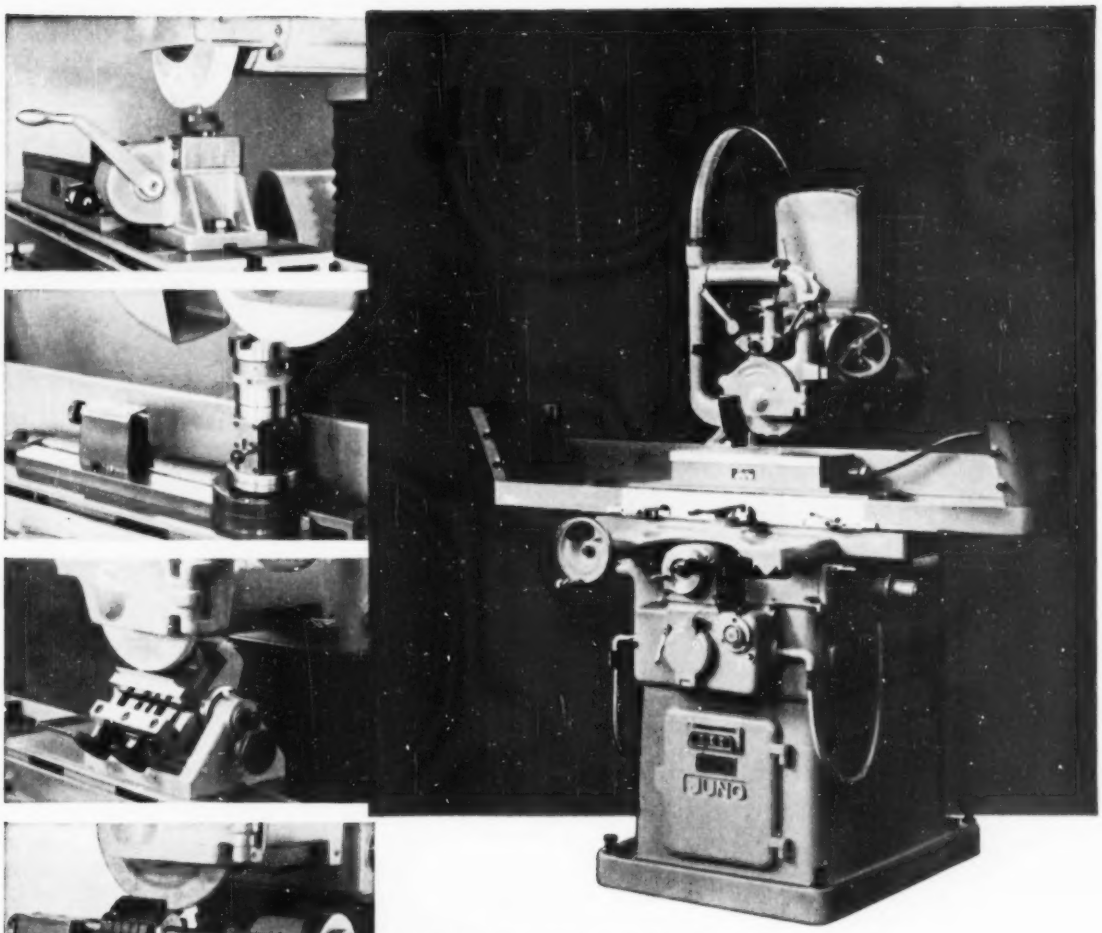
Device incorporates a reticle in a flat-field optical system, and a self-enclosed concentrated beam of light. It provides a clear image of the indentation with the sharp image of the reticle superimposed. Scale is calibrated in millimeters and tenths of millimeters. Total length of scale is 7.0 mm; dia of field of microscope is 7.5 mm. Unit has a magnification of 20 diameters; it can also be used wherever a microscope is needed to make all other flat measurements within the range of 7.0 mm. Price, $56.50.

Pacific Transducer Corp, 11921 W Pico Blvd, Los Angeles, Calif

Anchor Nut Holder

E H Stau is manufacturing and marketing a Northrup Aircraft developed anchor nut holder used for positioning and holding anchor nut plates in alignment during riveting of the nut plates to structural parts. The holder is a short bolt of 1020 steel, threaded at one end with a nut on the other and hollow tubing between. It is self-locking, eliminating inaccuracy of positioning anchor nut plates.

E H Stau Co, 351 Atlantic Blvd, Los Angeles, Calif



SURFACE GRINDERS

MODEL **JUNG G 60**

for versatile use in tool-rooms and for the making of devices, especially if high precision and low working times are demanded.

with hydraulic table-drive and infinitely variable adjustment of the grinding speed within far limits. Removable-unit-type grinding spindle equipped with the approved, adjustable ball bearings "JUNG" with increased precision, micro-adjustment for grinding spindle head infinitely variable; dust protection perfect in design and construction.

to be delivered with work-holding attachments for location of the most difficult and most delicate work-pieces.

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GÖPPINGEN WÜRTTBG.
WESTERN GERMANY

TWO MILLION WITHOUT A FAILURE!

parts: small connecting rods

alloy: "600" series metal, a high strength bearing bronze that contains no tin

quantity to date: over 2,000,000

number of failures: none

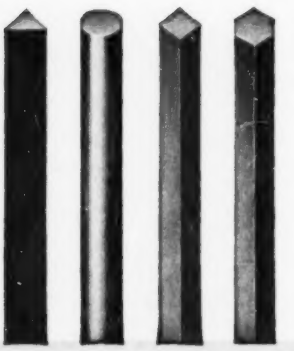
forged by: Mueller Brass Co.

advantages: no bearing insert is necessary on either the wrist pin or crankshaft end because each rod acts as its own bearing. Dense homogeneous grain structure, close dimensional tolerances and high mechanical properties often permit redesigning for weight savings as high as 15% to 25%. "600" alloys have low coefficient of friction, high resistance to corrosion and tensile strength 2½ times greater than cast phosphor bronzes.

uses: compressors, outboard motors, small high speed gasoline engines. Best results are obtained if they operate against hardened, ground and polished shafts.

"600" SERIES ROD is produced in standard 12-ft. mill lengths and a wide range of sizes and special shapes. This rod has a fine, uniform grain structure and the mechanical properties are rigidly controlled in the cold drawing process. Scrap loss is greatly reduced in machining operations because of the complete absence of defects. For complete information, write us today.

104



MUELLER BRASS CO.
PORT HURON 23, MICHIGAN

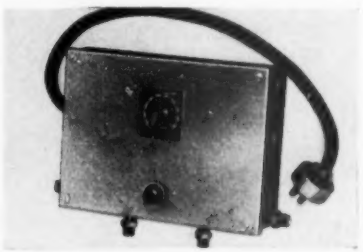
Static Pressure Controls Improved for Longer Life

Cat. 104 sensitive static pressure controls are now available with silicone-impregnated glass-cloth diaphragms, instead of neoprene, where operation at high or low temperatures over long periods of time is required.

Controls are for application on very low pressures where regulation is required in inches of water; also, for use as a safety switch, indicating airflow in electronic equipment; air conditioning; and varied industrial applications.

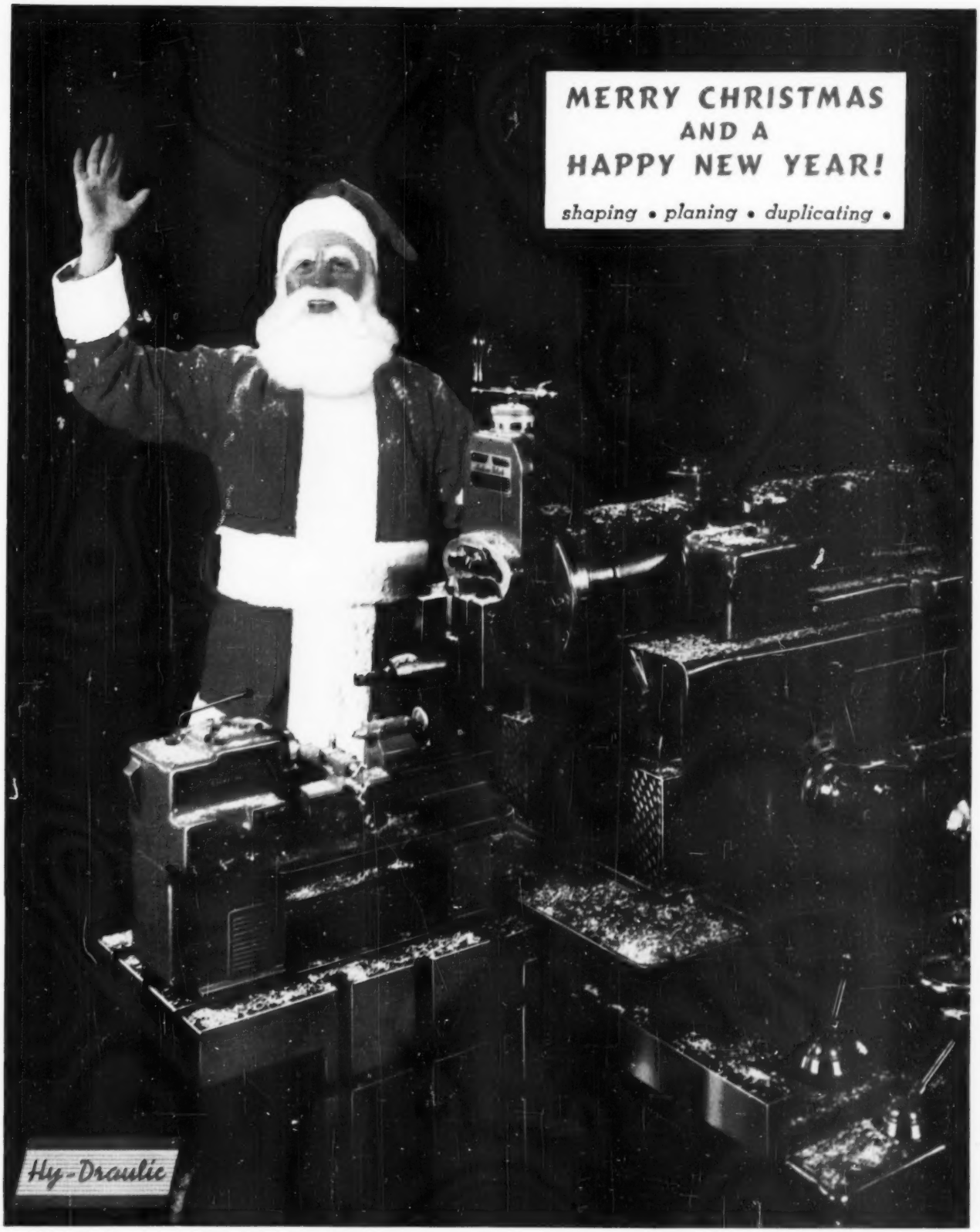
Units, adjusted at the factory to customer's specifications, can be made to operate at any value from 0.3 to 20-in. water pressure with fixed differentials of approximately 10% of operating pressure. Electrical ratings are approved by Underwriters' Laboratories for 10 amp 125 v, or 5 amp 250 v ac. Installation requires only one hole to mount on a vertical wall or duct.

Henry G Dietz Co, 12-16 Astoria Blvd, Long Island City 2, NY



Device Saves Gas, Water In Inert Gas Welding

Mullenbach Gastrol, an automatic control for all inert gas welding, limits flow duration of both gas and water to necessary welding and cooling periods. Since cold water circulation is stopped through the electrode holder during off-welding periods, condensation is prevented,



Rockford Machine Tool Co. Rockford, Illinois

Tool up Quick ...Cut Faster

with CARMET® CARBIDE METAL

STANDARD TOOLS AND BLANKS

GET THE NEW

CARMET CATALOG

Just out . . . 32 well-illustrated pages, containing data on all Carmet grades, and on Carmet blanks, tools, die sections, punches, draw die inserts, etc.; also special preforming to order.

● *Write for your copy.*

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Need cutting tools in a hurry? Just name the standard styles and carbide grades desired . . . get prompt shipment from a distributor's stock *near* you, or from the Carmet plant.

Our line of carbide "standards" is complete. It covers 90% of all single-point operations. Carmet Standard Tools come ready to use . . . easy to modify for special purposes, by grinding. Style C, illustrated, is designed particularly for conversion into various shapes for numerous applications.

Other standard Carmet styles also are immediately available from local stocks.

Order Carmet Tools and Blanks for better, faster, cheaper cutting. There is a grade to take care of every need. Write the *Allegheny Ludlum Steel Corporation, Carmet Division, Wanda and Jarvis Avenues, Detroit 20, Michigan.*

WBU 4582

For complete MODERN Tooling, call

Allegheny Ludlum

AL® FINE TOOL STEELS SINCE 1854

thus eliminating contaminated welds.

No mechanical or electrical connection exists between the Gastrol panel and welder other than an independent control system and supply hoses. Panel works equally well with ac or dc welders, and is operated on standard 110-v ac power.

When gas and water ar flowing, a safety light gives positive indication. Adjustable, electronic timer permits variation of the electrode cooling period of from 5 to 30 seconds, then automatically shuts off both gas and water.

Unit measures 10x7⅜x3⅛ in. and is furnished with a twist-lock receptacle for connecting a Mullenbach Arctrol or other remote welding heat control device. Maker claims 50% gas savings and less electrode consumption through proper cooling.

Mullenbach Electrical Mfg Co, 2300 E 27th St, Los Angeles 58, Calif

Miniature Hydraulic Valve For Two- or Three-Way Use

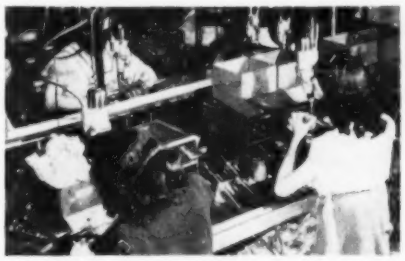
Model V10-1000 miniature hydraulic valve can be utilized as a two- or three-way valve in either normally open or closed positions. Principal application is in the automatic operation of single- and double-acting hydraulic cylinders, or for pilot control of large three- and four-way hydraulic valves. Unit can handle hydraulic fluids at pressures up to 1000 psi.

All internal parts are stainless steel; slide mechanism has precision-ground piston and bore held to extremely close tolerances, assuring minimum leakage factor. The 1½-lb valve is 3 7/16 in. high, 1⅝ in. in dia; has ⅛-in. NPT threaded ports; orifice dia of 3/32 in., and availability for full range of ac and dc voltages.

Skinner Electric Valve Div, Skinner Chuck Co, 137 Belden Ave, Norwalk, Conn

"400% Faster!"
"Output Up 110%!"
"Costs Cut 64%!"

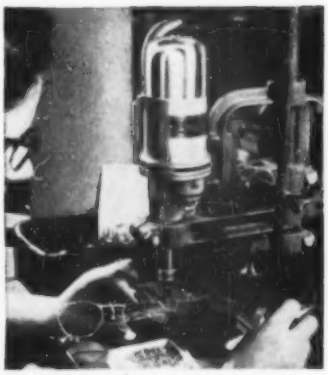
6 typical examples of how Millers Falls "Adjustomatic"® Clutch Electric Screw Drivers are saving time and money on thousands of assembly lines



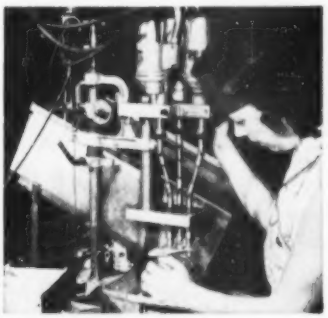
TV TUNERS. High power combined with hair-fine torque control — those are the qualities that won Millers Falls the nod over competing drivers on this exacting application.

TRAVERSE TRACKS. Drive screws too tight — and tracks crush. Not tight enough — and stops loosen. Millers Falls' record on this job: Rejects, nil — speed, up 400%.

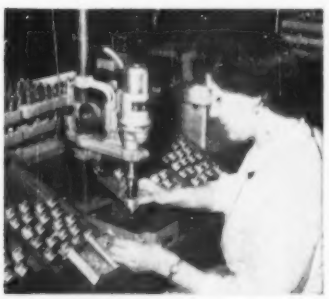
MINIATURE MOTORS. Problem: To drive tiny self-tapping screws without stripping or splitting a thin plastic housing. **Solution:** Millers Falls No. 52's. **Result:** Production up 110%.



EYE GLASS FRAMES. Driving tiny optical screws — traditionally an "impossible" job for a power driver. Yet Millers Falls drivers are doing it — and cutting labor costs 64%.



WINDSHIELD WIPERS. Ingenious, multiple-driver installations like this are one secret of the success of a leading manufacturer in this highly competitive field.



HEATING CONTROLS. Speed, accuracy, economy — on all three counts, this manufacturer chose Millers Falls after extensive tests with other electric and pneumatic drivers.

There's a Millers Falls Driver that's Right for Practically Every Driving Problem

Write for full information or let us arrange a demonstration on Millers Falls drivers and many other high-performance electric tools for production and maintenance.

MILLERS FALLS COMPANY
Greenfield, Mass.

MILLERS FALLS TOOLS
SINCE 1868
The Mark of Superiority

We know that those of you who use Ettco-Emrick Tapping Attachments will close your books on a full year of profitable, trouble-free tapping. Now, we'd like to wish all our old friends—and new friends—another happy and prosperous new year.

If fast, accurate tapping with minimum tap breakage and work spoilage contributes in any way to the success of *your* new year—we at Ettco will feel our wish has been granted.

Ettco-Emrick ...for drilling and tapping equipment at its best!

ETTCO TOOL CO. INC., 600 JOHNSON AVE., BROOKLYN 37, N.Y.

Dealers throughout the United States and Canada

DRILLING and TAPPING EQUIPMENT NEWS

Tapping Machines Boost Multiple Head Output

Ettco-Emrick tapping machines are designed for automatic or semi-automatic operation with multiple spindle drilling or tapping heads and single spindle tapping attachments. The No. 72A machine is foot or air-operated. The No. 74 machine is air operated and electrically controlled. *Details in Bulletins No. 72A and No. 74. Write Ettco Tool Co., 590 Johnson Avenue, Brooklyn 37, N. Y.*

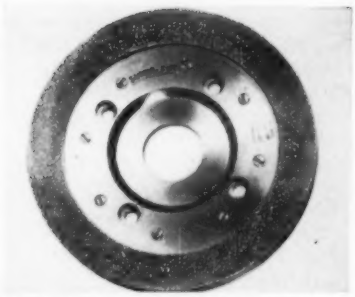
Electric Indexing Fixture Has Fast, Precise Action

Ettco-Emrick Indexing Fixtures provide smooth, shockless, positive action. Can be used on any machine base. Synchronization of index fixture with outside machine member is electrically controlled. Utilizes interchangeable nesting plates ranging from 10" to 14" in diameter. *Details in Bulletin No. 97. Ettco Tool Co., Inc., 590 Johnson Ave., Brooklyn 37, N. Y.*

Balanced Tap Chuck Insures Greater Accuracy

Balanced construction of this newly designed precision-made Ettco-Emrick tap chuck eliminates "whipping" action and insures greater accuracy. Light weight and small external dimensions minimize spindle inertia on reversing, making it suitable for either light, sensitive work or heavy duty jobs. Only three sizes needed to cover the complete range of tap capacities from No. 0 to 1". *For details, write Ettco Tool Co., Inc., 590 Johnson Ave., Brooklyn 37, N. Y.*

(Advertisement)



Single-Layer Diamond Wheel Cuts Costs on Standard Grinders

Super-Cut has introduced a low-cost single-layer diamond wheel for final micro-finish work; tests have produced up to 4900 single-point carbide tools at a diamond wheel cost of less than one cent per tool.

All diamonds are accurately positioned with protruding points in one plane so that each diamond is working, regardless of minute differences in particle size. Wheel, made with hard nickel bond, can be indicated and trued to 0.0005 in. when installed because of Eze-Tru process which provides for truing wheel to back plate by tensioning auxiliary screws at low point of wheel. This is said to assure maximum diamond life because few back plates run absolutely true after they are in use a short while.

Wheel fits practically all standard grinders; a two-wheel carbide tool grinder can be converted into a diamond wheel grinder by substituting wheels. Price, $45.

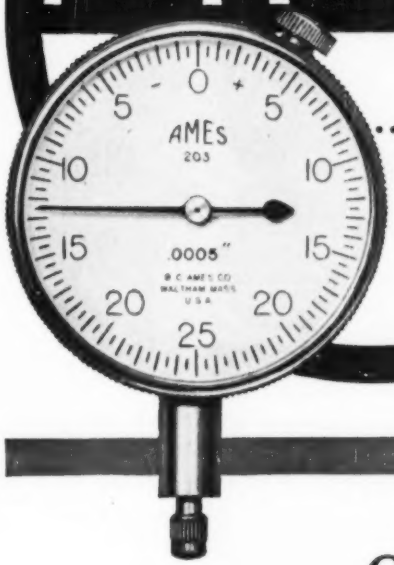
Super-Cut Distributors, Inc, 3418 N Knox, Chicago 41, Ill

Gas-Fired Soldering Furnace Has Radiant Burner as Heat Source

Gas-fired soldering furnace, using a radiant burner as a heat source, can heat in less than eight minutes two 4-lb irons from room temperature to 900 F, or one 4-lb iron to 1200 F, with a heat input of only 9100 Btu per hr.

Burner is located so that mechanical shock and flux corrosion damages are held to a minimum. Refractory hearth is easily removed and cleaned. Die-pressed furnace lining is quickly

AMES



...the preferred Dial Indicators

One of America's largest and most famous mass-producers recently chose Ames as preferred source of supply for indicator gauges.

The reasons behind this decision are the very reasons why *you* should standardize on Ames dial indicators and dial gauges:—the Ames "Hundred Series" indicators available in four sizes, fit every measuring requirement; they are *accurate, sensitive,* low in friction, yet are *rugged* and *tough*—give *more* on-the-job time. All Ames products embody latest design and highest-quality materials; they are manufactured by methods and machines that are *exclusive* with B. C. Ames Co.

Ames Dial Depth Gauge No. 11C

Ames Dial Micrometer No. 517

Ames Amplifying Dial Comparator No. 26

Ames Small Hole Gauge No. 36

Send today for your free copy of Catalog No. 58

Representatives in principal cities. B. C. AMES CO. *26 Ames Street Waltham 54, Mass.*

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

NOW! JIFFY Cast TIRES

STANDARD EQUIPMENT ON

Walker-Turner Band Saws

Proof of Acceptance is that this manufacturer has joined the ranks of *leading* band saw manufacturers using CARTER Jiffy Tires as standard equipment because

- *Jiffy Tires can be changed in 10 minutes*
- *Provide 2 to 4 times more wear*
- *Provide perfect traction and balance*
- *Jiffy Tires are safe . . . won't throw at any speed*

16" Band Saw
WALKER-TURNER DIV.
Kearney & Trecker Corp.
Plainfield, New Jersey

Available only thru Band Saw Manufacturers

CARTER PRODUCTS COMPANY, INC.

429 Wm. Alden Smith Bldg. 30 Ionia Ave., S. W.
Grand Rapids 2, Michigan

A MODERN TIRE FOR A MODERN SAW

"No, that isn't the new Kinsey report, it's Pete's Columbia Tool Steel Catalog!"

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

installed, should replacement be required. Heating is accomplished without flame impingement, yet soldering copper is surrounded by fully burned gases which eliminate oxidation and burning of copper, enabling it to retain a bright, tinned working surface over a greatly lengthened effective life.

Lower heat input is possible because of higher heat transfer rates in radiant heat. Lowered input, plus use of high quality insulating lining, prevents high temperatures in furnace casing. Tilted shelf prevents escape of much of the excess heat, which is carried off through a flue.

Selas Corp of America, Erie Ave & D St, Philadelphia 34, Pa

Portable Power Hacksaw Makes Angular Cuts in Any Position

Portable power hacksaw, called the Hand-I-Hack, is a 50-lb unit designed to cut, in any position, metal, plastic, or fiber stock of 3-in. or less diameter at any angle from 45 to 90°.

Saw blade draw cuts and then lifts on its return stroke, eliminating necessity for weights; saw can be operated vertically, horizontally, or upside down. With its work vise clamped to a stanchion or pipe, the unit is self-supporting, ready to make repeated cuts within a tolerance of 0.010 in. sq.

Operation is fully automatic, shutting itself off after completing a cut. Blade speed of 115 strokes per minute, without load, is provided by a steel worm and a bronze worm gear, sealed in oil, and powered by a standard 1/3-hp electric motor. Vise, with sliding jaw, is adjustable and calibrated for cutting angles up to 45°.

Lipe-Rollway Corp, Emerson Ave, Syracuse 1, NY

Rectangular Toolbits

The duMont Corp has added a standard range of super-high-speed rectangular ground toolbits to their line of square bits. These toolbits are composed of precisely blended and balanced carbon and vanadium. They are heat-treated to achieve a hardness of 66 to 68 R_c without carburizing and are ground to close tolerances.

The duMont Corp, Greenfield, Mass

ASK BAIRD ABOUT IT!

HIGH PRODUCTION TOOLING

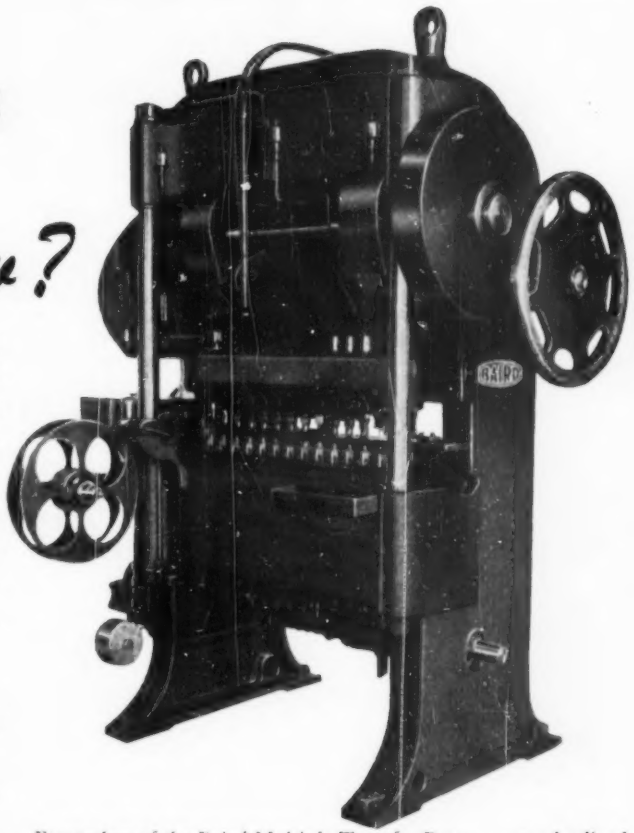
Biting off *More* than you can *Chew?*

Many types of small stamping machines can bite off coiled metal stock, but the BAIRD MULTIPLE TRANSFER PRESS cleverly chews each length into accurately formed products at the rate of thousands of pieces per hour.

Almost-human transfer fingers automatically grip and carry the work to progressive die stations where blanking, drawing, piercing, embossing, slitting, trimming, broaching, sizing, hexing, forming, etc., complete the piece.

Simply stated, the Transfer Press combines, in a single cycle, operations that otherwise might require several smaller machines with an operator for each. There are almost endless tooling possibilities . . . set-ups that turn out millions of small parts at extremely low cost.

An installation of Baird Multiple Transfer Presses puts the buyer in a most favorable competitive position in a buyer's market. Better "ask Baird about it!"



Front view of the Baird Multiple Transfer Press . . . standardized in 12 sizes with rated working pressures from 5 to 55 tons. Coiled stock from 2½" to 4" in width is automatically fed at high speeds.

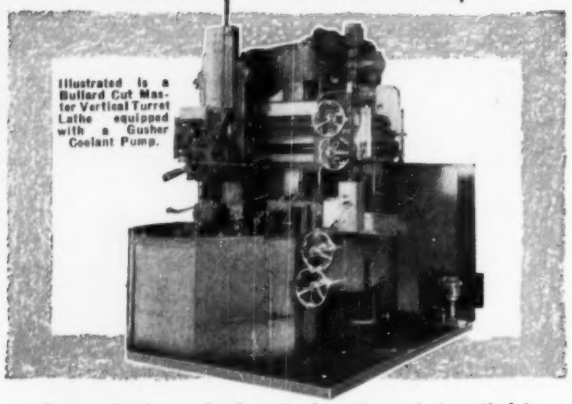
SEND FOR TRANSFER PRESS BULLETIN

6BA53

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

Low Cost Operation
is yours with a **RUTHMAN**
Gusher Coolant Pump



Once a Ruthman Gusher Coolant Pump is installed it requires little or no attention. The pre-lubricated heavy-duty ball-bearings require no further lubrication, there are no packing glands to adjust. The dynamically balanced rotating shaft minimizes vibration and wear. Minimum power is consumed when the Gusher is throttled down. You are sure of low cost operation when you specify Gusher Pumps on your machine.

THE RUTHMAN MACHINERY CO.
1818 Reading Road Cincinnati, Ohio

C & J *Geared-Head* LATHES
16 INCH • 12 SPEED

FOR HIGH GRADE
PRACTICAL GENERAL SERVICE
Guaranteed accurate to good commercial standards.

- Tooled and equipped for efficient production
- Exceptionally long carriage bearing — 23⅜ in.

Write TODAY for new bulletin 39-A-10.

ONLY ONE MODEL • ONLY ONE SIZE

- Feed provided by separate rod—lead screw is used only for thread chasing

Complete regular equipment includes thread indicator.

CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO

Precision and Extra-Precision Baldwin Load Cells Available

Two new series of precision and extra-precision Baldwin SR-4 load cells for measuring forces and weights, based on the SR-4 bonded resistance wire strain gage, have been developed by Baldwin-Lima-Hamilton. They include 18 compression load cells (Type CX and CXX) in nine capacities ranging from 500 to 200,000 lb, and 16 tension load cells (Type TX and TXX) of eight capacities ranging from 500 to 100,000 lb.

Both series are mechanically and electrically interchangeable with standard cells. Essential difference between classes is the finer tolerances to which cells are calibrated and temperature-compensated, making possible high accuracy force measuring and weighing systems.

Extra-precision cells (Type CXX and TXX) have a calibration accuracy within ±0.10% of full-scale output adjustment at 65 F as compared with 0.25% for the present 24 standard cells. Nominal output at rated capacity is 2.0 mv per v.

Precision cells are intermediate in characteristics. Calibration accuracy is within ±0.15% at full-scale output.

Compression cells range in size from 4 13/16 to 11⅝ in. in overall height, and from 3 to 8 in. in dia. Tension cells range from 4 7/16 to 17¾ in. in height, and from 3 to 9 in. in dia.

Baldwin-Lima-Hamilton Corp, Philadelphia 42, Pa

Internal Burring

Sheffield Model 388 was designed to chamfer the involute contour of internal spline and gear teeth, either straight or helical, around their full form. Production rate is said to vary up to 300 teeth per min, allowing changeover to another type of gear in less than 30 min.

The Sheffield Corp, Dayton 1, Ohio

Diamond Dressing Tool

US Diamond Wheel Co tool is said to cut the cost of diamond wheel operation and assure longer carbide tool life between grinds. The device is a hand hone tipped with diamond concentrate. A hollowed-out finger rest near the hone provides fingertip control.

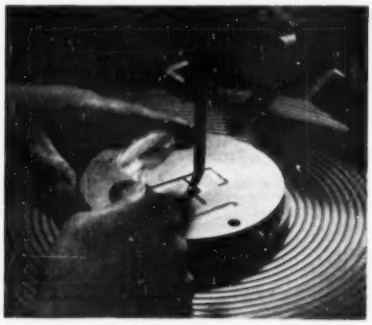
The tool is available in single- or double-end styles and in all required diamond grit sizes. Five-tool sets are packed in a plastic box.

US Diamond Wheel Co, 835 Illinois Ave, Aurora, Ill

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



Finishing touches are applied to a die made of Cr-Mo-W (Chrome-Moly-Tungsten) at extrusion plant of Kaiser Aluminum & Chemical Corp.

Lathe operator calipers die blank, made of Cr-Mo-W. This long-wearing, air-hardening steel, easy to machine, has good shock resistance.

• • • • • • •

BETHLEHEM TOOL STEEL ENGINEER SAYS:

To Reduce Tool Failures Always Remove the "Feather" Edge

After tools are ground, a rough "feather" may often be found along the working edges. If this feather is permitted to remain, the chances are good that the cutting edges will dull prematurely. Or the tool may even fail after brief service. For best results it is advisable to remove these surface irregularities immediately after grinding. This is especially true of cutting tools.

We know several shop men, each of whom makes it a point to carry a pocket stone, just for this use. When a feather is noticed, out comes the stone. This worthwhile precaution results in longer tool life, and greater shop economy.

Why they chose this Hot-Work Steel for Aluminum Extrusions

They wanted a hot-work steel with great resistance to wear, capable of withstanding severe shock and drastic changes in temperature, and with the ability to provide trouble-free service in long production runs. And it's for those reasons that the die specialists at the busy extrusion plant of Kaiser Aluminum & Chemical Corp., located at Halethorpe, Md., are well pleased with the performance of Cr-Mo-W (Chrome-Moly-Tungsten) for the manufacture of aluminum extrusions.

Bethlehem Cr-Mo-W, a general-purpose type of hot-work tool steel, has a 5 pct chromium content, plus moly and tungsten. It is especially suited for jobs that involve shock or radical temperature changes, and for all applications where heat-checking is a problem.

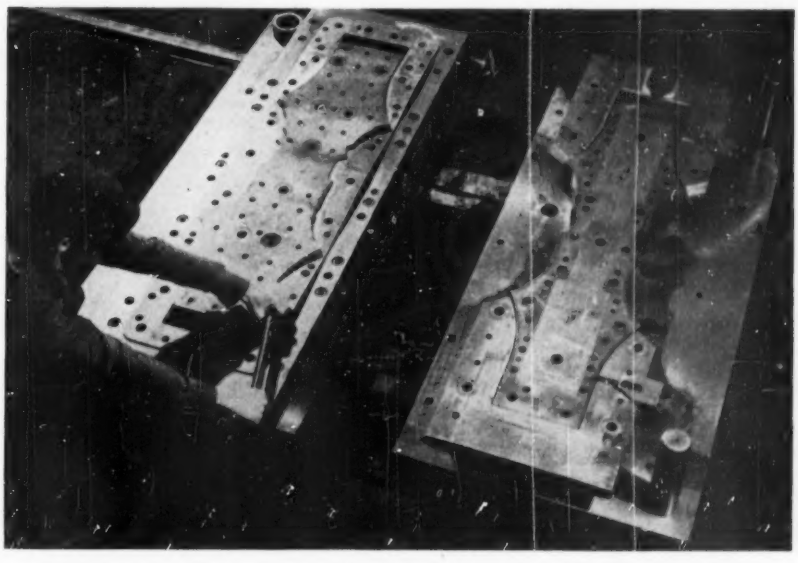
Cr-Mo-W hardens in air. It has good red-hardness, and fine resistance to distortion during heat-treatment. It is an easy steel to machine because it can be annealed to 217 Brinell.

TYPICAL ANALYSIS

Carbon ... 0.35 Tungsten .. 1.55
Silicon ... 1.05 Molybdenum 1.65
Chromium....5.00

Cr-Mo-W withstands severe impact on such highly-stressed parts as trimmer dies, die-casting dies, bolt-gripper dies, hot-shear blades, and various types of punches.

If you have a job calling for a hot-work steel able to take shock and wide changes in temperature, and hold its dimensions through long production runs, give Cr-Mo-W a tryout. You can get full information, and quick delivery, from the nearest Bethlehem tool-steel distributor.



DIE TO BLANK DIFFERENTIAL HOUSINGS

This large die, made of A-H5, is used in the cold blanking of sheet steel for the manufacture of truck and automobile differential housings. A-H5, another Bethlehem 5 pct chrome air-hardening grade, with 1.00 pct carbon, is used for this application because of its wear-resistance, and easy machinability.

MACHINE OF

MODEL R-18 AUTOMATIC *Lo-swing* LATHE MACHINES LARGE CYLINDER LINERS AT FAST PACE

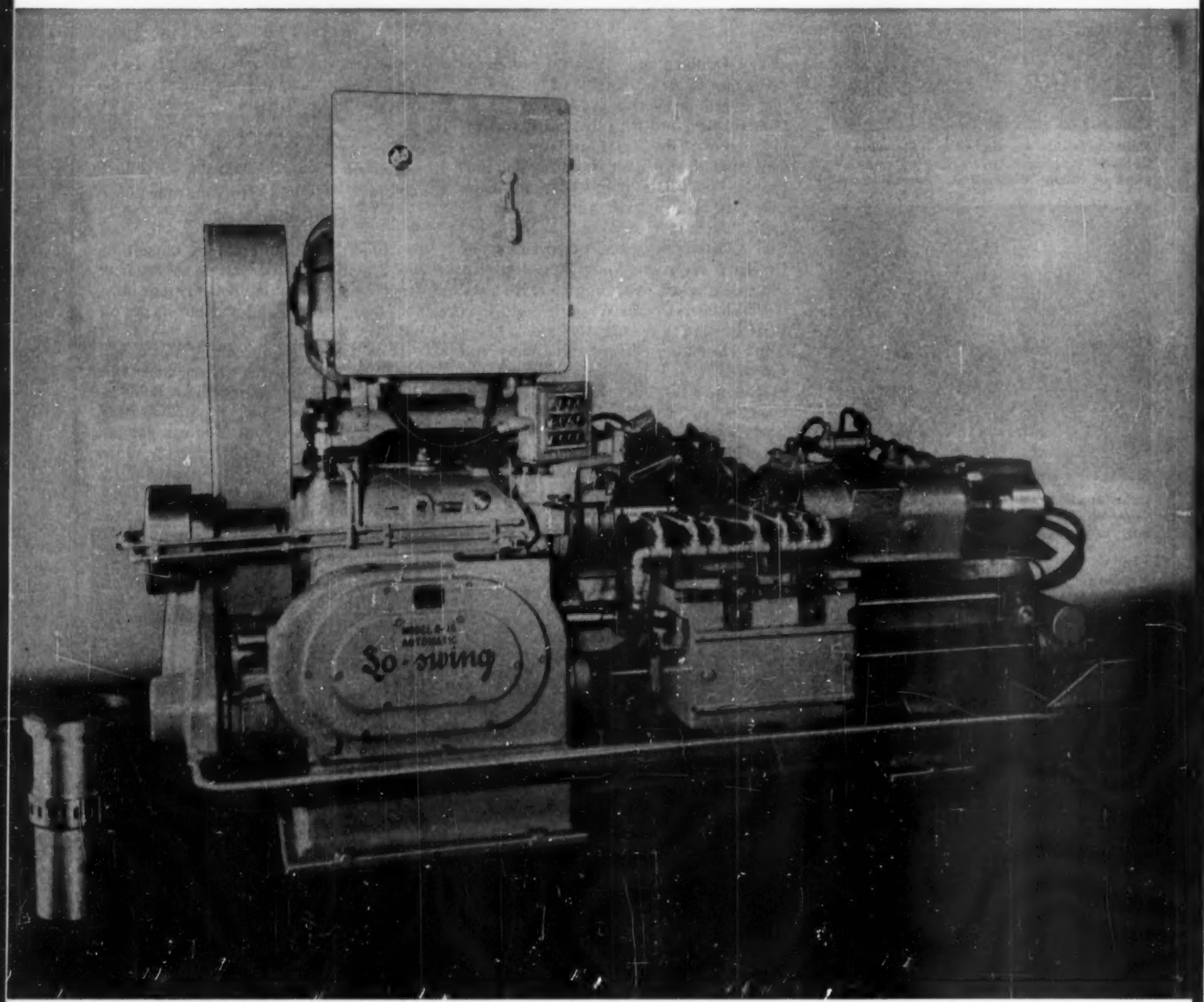


Fig. 1. *Model R-18 Lo-swing Lathe equipped for machining large cylinder liners*

PRODUCTION COSTS

THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

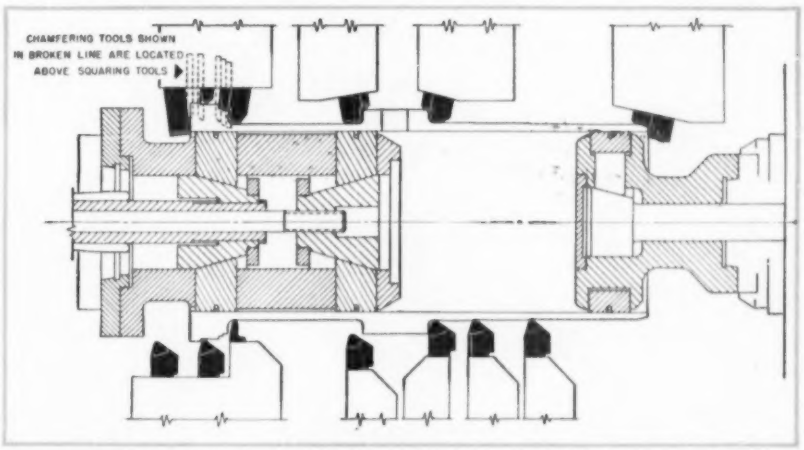


Fig. 2. *Details of arbor construction and location of 22 cutting tools*

Problem: **To turn outside diameters, face shoulders and chamfer large cylinder liners 11-1/2″ diameter by 22″ long.**

Solution: **The large swing Model R-18 Automatic Lo-swing Lathes selected for this job were equipped with special tailstocks and tooling engineered for this particular job.**

The work is held and driven by a special driver, mounted on the headstock spindle, which has two rows of six, air-operated driving jaws. Each row is operated by its individual pull bar (Fig. 2) thus equalizing the air pressure on both sets of jaws. In order to avoid distortion and provide increased support, both sets of jaws grasp the work piece where the wall thickness is greatest.

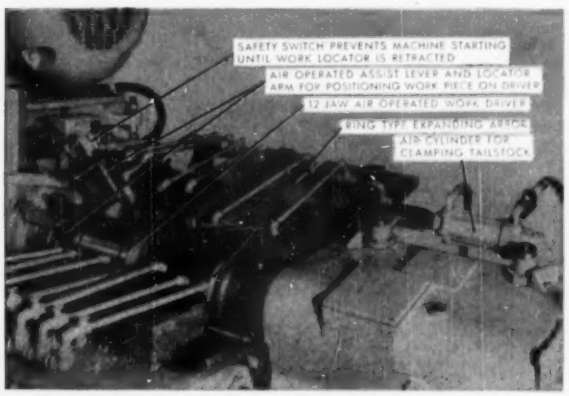

SAFETY SWITCH PREVENTS MACHINE STARTING UNTIL WORK LOCATOR IS RETRACTED
AIR OPERATED ASSIST LEVER AND LOCATOR ARM FOR POSITIONING WORK PIECE ON DRIVER
12 JAW AIR OPERATED WORK DRIVER
RING TYPE EXPANDING ARBOR
AIR CYLINDER FOR CLAMPING TAILSTOCK

Fig. 3. *Close-up view of special tooling and tailstock*

The relieving type tailstock has a 20 inch stroke, operated by a motorized lead screw, permitting easy removal of the cylinder sleeves from the long driver. Its large revolving spindle is fitted with an air-operated, ring type expanding arbor which supports the work at the tailstock end.

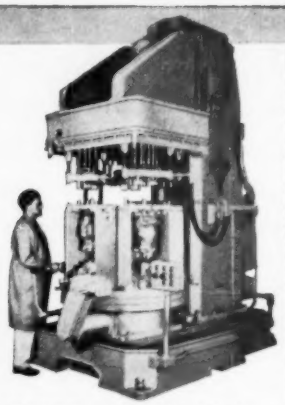
The work is located in relation to the ports previously cut around the liner body by a locator arm (Fig. 3) which enters one of the ports when swung downwards. The operator then positions the piece on the driving arbor with an air-operated assist lever which holds it tight against the locator until the driving jaws grasp it. A safety switch above the locator arm prevents the machine being started with locator in engaged position.

A 60 HP motor drives the machine. Floor to floor time is 5.2 minutes, demonstrating the substantial economies possible with Lo-swing methods. Let Seneca Falls engineers assist with your turning problems.

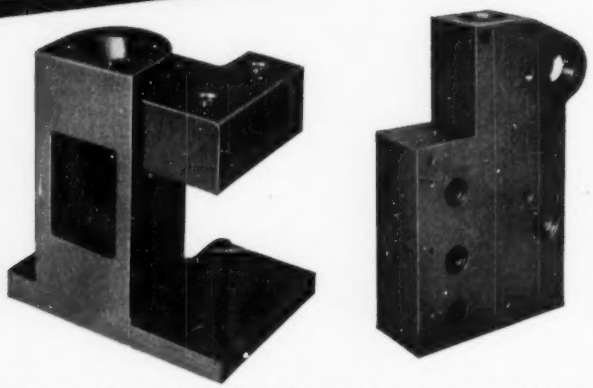
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

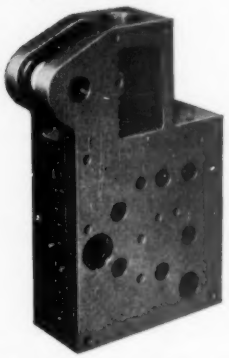
ARE LOWER WITH Lo-swing

When HIGH Pressures Create Problems Solve Them With MEEHANITE® CASTINGS



NATCO—C4A Multiple Drilling, Boring, Facing and Tapping Machine





Views of Control Panel Valve Bodies, Pressures Up to 1500 p.s.i.

PRESSURE TIGHTNESS, of course, requires DENSITY,—and density can be achieved only by close control of each and every step in casting manufacture;—from charging floor to shipping platform. Meehanite foundries have long been noted for the QUALITY of their product, a result of their use of Meehanite process controls;—controls which result in uniform—dense—better property castings.

PROOF of this is found in the important applications of Meehanite castings made by the National Automatic Tool Co., Inc., Richmond, Indiana, in hydraulic control valve bodies. These units are the heart of the operating mechanism of their line of NATCO Drilling, Boring, Facing and Tapping Machines. The castings and the machine tool are illustrated.

Write for Bulletin #10—Meehanite, The Metal For Pressure Castings. It may give you an idea that will lead to the solution of one of your problems.

Only a **MEEHANITE** *Foundry Can Make* **MEEHANITE** *Castings*

American Brake Shoe Co.	Mahwah, New Jersey
The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington and Dover, New Jersey
E. W. Bliss Co.	Hastings, Mich. and Toledo, O.
Builders Iron Foundry	Providence, Rhode Island
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
Crawford & Doherty Foundry Co.	Portland, Oregon
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio and Grove City, Pa.
M. H. Detrick Co.	Newark, N. J. and Peoria, Ill.
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
Fulton Foundry & Machine Co., Inc.	Cleveland, Ohio
General Foundry & Manufacturing Co.	Flint, Michigan
Greenlee Foundry Co.	Chicago, Illinois
The Hamilton Foundry & Machine Co.	Hamilton, Ohio
Hardinge Company, Inc.	New York, New York
Hardinge Manufacturing Co.	York, Pennsylvania
Johnstone Foundries, Inc.	Grove City, Pennsylvania
Kanawha Manufacturing Co.	Charleston, West Virginia
Koehring Co.	Milwaukee, Wisconsin
Lincoln Foundry Corp.	Los Angeles, California
London Concrete Machinery Co., Ltd. (Hartley Fdry.)	Brantford, Ontario
E. Long Ltd.	Orillia, Ontario
Otis Elevator Co., Ltd.	Hamilton, Ontario
Palmyra Foundry Co., Inc.	Palmyra, New Jersey
The Henry Perkins Co.	Bridgewater, Massachusetts
Pohlman Foundry Co., Inc.	Buffalo, New York
The Prescott Co.	Menominee, Mich.
Rosedale Foundry & Machine Co.	Pittsburgh, Pennsylvania
Ross-Meehan Foundries	Chattanooga, Tennessee
Shenango-Penn Mold Co.	Dover, Ohio
Sonith Industries, Inc.	Indianapolis, Ind.
Standard Foundry Co.	Worcester, Massachusetts
The Stearns-Roger Manufacturing Co.	Denver, Colorado
Traylor Engineering & Mfg. Co.	Allentown, Pennsylvania
Valley Iron Works, Inc.	St. Paul, Minnesota
Warren Foundry & Pipe Corporation	Phillipsburg, New Jersey

"This advertisement sponsored by foundries listed above."

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714 North Avenue

NEW ROCHELLE, N. Y.

MEEHANITE MEANS BETTER CASTINGS

Multiple Hole Punching System Has Interchangeable Assemblies

Wales multiple hole punching system has been introduced with punch retainer plates for unlimited patterns. Entire setup can be made outside stamping press or press brake. Punch assemblies and dies are interchangeable, permitting same parts to be used and reused.

System is available in two ways: (1) All individual parts are available for users to stock for assembling setups, permitting making and operating a hole punching die the same day a templet is completed. (2) Manufacturers will build complete assemblies, ready to operate, and will guarantee accuracy of hole locations.

Multiple hole punching boxes are available from 6x6 in. to 24x24 in., larger sizes made to order. Holes are located and drilled in punch and die plates of boxes from a master templet; they may be located over entire working area of setup for inserting punch assemblies and dies. Self-contained system requires no aligning before or after setups are placed on press bed; punching starts with first stroke of the ram.

Wales-Strippit Corp, 345 Payne Ave, N Tonawanda, NY

Benchmaster Koil-Kradle Feeds Variety of Automatic Machines

Koil-Kradle, for automatic feeding of all types of coiled stock to production machines, has an automatic trip bar which actuates a motor switch as slack loop is tightened. Motor then feeds a new loop at rate of 90 ft per minute continuous operation, automatically shutting off when correct loop size is reached; material is thus fed to the forming machine from a slack loop rather than from full weight of coil. Rate of feed to forming machine is universal, determined solely by the machine's individual requirements without adjustment by operator.

Trip bar lifts up for easy loading, completely exposing the throat of machine. Ramp is provided by which heavy coils can be rolled into cradle, eliminating lifting effort. Adjustable guide plate partitions the roll area, establishing correct width for various roll sizes; rolls may be rotated either direction for feeding or rewinding stock. Three sizes are currently built for 10-, 13-, and 15-in. roll widths, 36-in. dia. Machines may be used with punch presses, slitters, forming rolls, shears.

Benchmaster Mfg Co, 1835 W Rosecrans Ave, Gardena, Calif

Push or *Pull*

. . . and no matter which way you operate your broaching *machine* . . . it is still the *broach* that does the cutting.

When you entrust the accuracy of your broach to "Connecticut," and to "Durakeen," you obtain the degree of accuracy that pre-determines the quality and interchangeability of the broached parts. When finished with a Durakeen broach, the first and one-thousandth part are identical.

No one can give you better high-speed steel than Durakeen . . . and we have many loyal customers who feel the same way about the high quality of Connecticut broach design and production engineering.

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for a fabulous finish...

JEWEL BRAND
Abrasive Belts

for grinding, sanding, polishing —
metal, wood, leather, plastics, rubber.

ABRASIVE PRODUCTS, INC.
561 Pearl Street
South Braintree 85, Massachusetts

Stokes Redesigns Toggle Press

Redesigned Stokes semi-automatic toggle press, designated Model 731, is said to be especially suited for molding delicate insert parts.

Color-coded electrical circuits throughout provide easier maintenance and servicing. Seamless steel tubing is used for all oil lines. Additional improvements include a dustproof control box; fin-type coolers with extra capacity to keep oil temperature low and minimize packing and seal failures; larger platen area (24x24 in.); wider spacing between tierods, front to back, to provide greater stability and accommodate a wider range of knockout actions.

Three-stage automatically controlled closing action reduces closing time and speeds up production cycle. Redesigned regenerative circuit is said to provide exceptionally high speed during initial ram approach. Oil taken out of the top of the ram is fed back into the bottom, giving double the normal approach speed. Mold closes only as fast as material plasticizes, producing parts of high density and uniformity.

F J Stokes Machine Co, 5500 Tabor Rd, Philadelphia 20, Pa

Gleason Spur Gear Tester

Gleason No. 104 spur and helical gear tester tests running qualities as well as tooth spacing and concentricity.

Machine is designed for a power running test and also a composite check of spacing, profile shape, and runout. In the latter, the drive spindle is permitted to move horizontally up to 0.010 in. either side of center, and a calibrated spring provides any desired pressure from 0 to 5 lb in increments of 4 oz between the two mating gears. As gears are slowly rotated, an indicator gives a reading of composite errors. Unit is equipped with a device for recording the rolling test on paper.

Three spindle sizes are available for the various sizes of gears which fall within the machine's range. Maximum OD of gear that can be tested is limited only by the 4½-in. maximum center distance of spindles. Spindle speeds are 875, 1750, 3500, 7000, and 14,000 rpm.

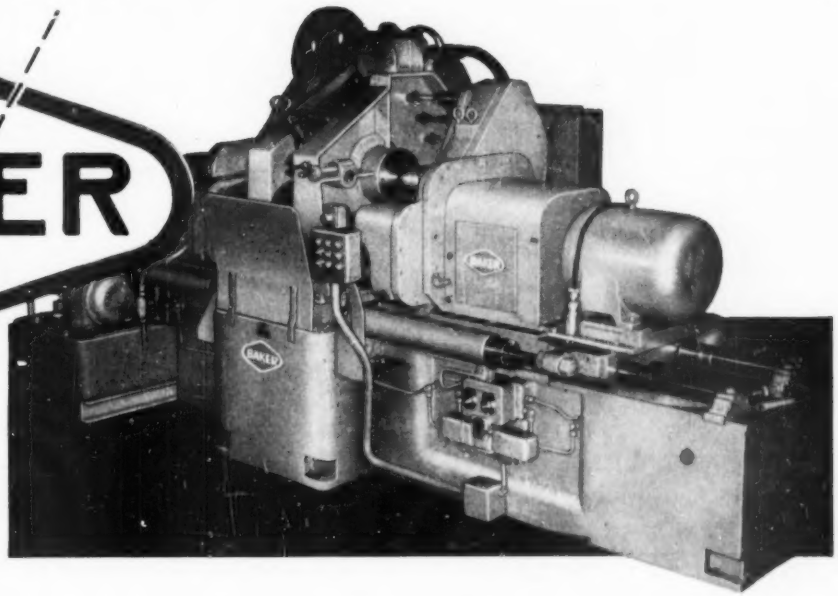
No 104 angular hypoid tester is also available for testing bevel and hypoid gears of any shaft angle and up to 4¼-in. dia. Range of shaft angle is 0 to 180°; gears with shaft angles less than 45° must be reverse-mounted.

Gleason Works, 1000 University Ave, Rochester 3, NY

Modern Machine Tools..

SLASH PRODUCTION COSTS!

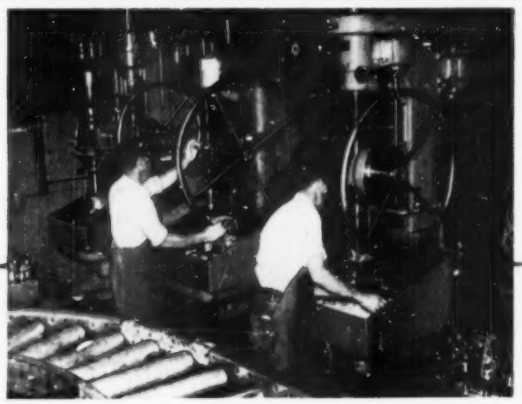
New
BAKER
Method



1 Operator . . .
1 Machine . . .

Multi-Operations Fully Automatic On 4 Parts Simultaneously—Load—Drill—Core Drill—Ream—Unload

THE OLD METHOD—



2 OPERATORS . . 4 MACHINES . .

Hand Controls + Excessive Handling + Capstan And Hand Engagement Of Feed + Operator Fatigue = Low Production Rate At High Cost.

INCREASE PRODUCTIVITY..
with a NEW BAKER 'Special'

WRITE REGARDING YOUR SPECIFIC JOB PROBLEMS...

BAKER BROTHERS, INC. Toledo, Ohio
DRILLING...TAPPING...KEYSEATING and CONTOUR GRINDING MACHINES

ARMSTRONG *Carbide* TOOL HOLDERS

For Higher Speeds, and Heavier Feeds

ARMSTRONG Carbide Tool Holders and ARMIDE (Carbide Tipped) Cutters come in cased sets for tool rooms and maintenance departments, and individually in all sizes for general machine shop and production turning. They permit not only the ready machining of sand-filled castings, the hardest and toughest steels as well as many heretofore "unmachinable" materials, but also make practical much heavier cuts and cutting speeds up to 600 f.p.m. on ordinary work. They also run from 10 to 100 times as long between regrindings.

Write for Catalog

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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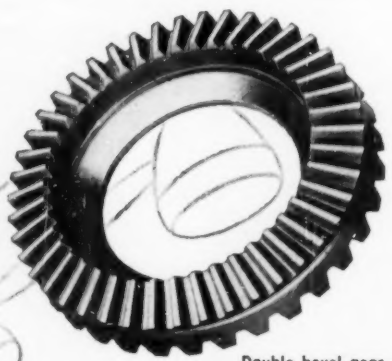

Double bevel gear—used in post hole digger

BRamble 7700 is our telephone number in Cincinnati. If you have a gear problem, call us—we would enjoy discussing it with you. We have been helping industry since 1907, and we can undoubtedly help you, too.

We are proud of our craftsmen, proud of our gears, proud of our reputation for quality. And we are proud of the fact that our customers can deal with us with complete confidence—an established, reputable firm with whom you, too, will enjoy working.

Spur	Internal
Helical	*Coniflex Bevel
Worm	Spiral Bevel
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For full information, write, wire, or call BRamble 7700.

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THE CINCINNATI GEAR COMPANY

"Gears . . . Good Gears Only"

Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio

Wilson Introduces Line of Motorized Hardness Testers

Rockwell hardness tester and superficial hardness tester have been motorized and are designated Y models.

Major load removal is performed by means of a motor and cam arrangement. Cycle of major load operation is less than two seconds; application is controlled through the dash pot, which gives an infinitely variable speed control.

Units are equipped with a Set-O-Matic dial gage which eliminates necessity of operator setting the dial to zero; the large pointer will automatically point to zero when the minor load is applied. Illuminated dial gage permits easy reading under any lighting conditions. An indentor light is directed towards the test area. The Y series is suitable for all testing now being done with the J model. Vertical gap spaces are 3¼, 8, 12, and 16 in.

Wilson Mechanical Instrument Div, American Chain & Cable Co, 230 Park Ave, New York 17, NY

Boring Jet Castings

Ex-Cell-O double-end machine does a similar boring job at both ends of a central hole in a magnesium air compressor inlet housing. Part is located in an angle plate fixture with gate-type clamp. Straight bores are machined as table feeds toward its respective spindle and chamfers are cut as table approaches end of feed stroke.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich

Permanent, Dry Lubricant

Drilube is a dry, permanent, flexible, solid-surface film lubricant bonded to the surface to which it is applied.

Coatings, containing molybdenum disulphide, are characterized by high film strength and low coefficient of friction at extreme bearing pressures at both low and high speeds. Product is said to withstand extremes in temperature ranging from a continuous exposure of −100 to +550 F, and intermittent exposure of +700 F. Applicable to steel, stainless, brass, aluminum and its alloys, and other metals. Can also be applied to rubber and certain plastics as a preservative fluid- and wear-resistant coating.

In a test involving extreme pressure lubrication of gears operating between 67 and 160 F, Drilube was used and units were still in good condition after 1030 hours of operation; they had previously been failing in less than 500 hrs.

Drilube Co, 725 W Broadway, Glendale 4, Calif

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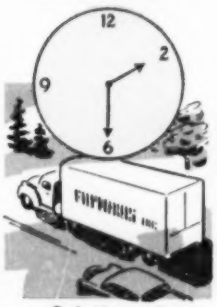
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Southern States Iron Roofing Co., Richmond

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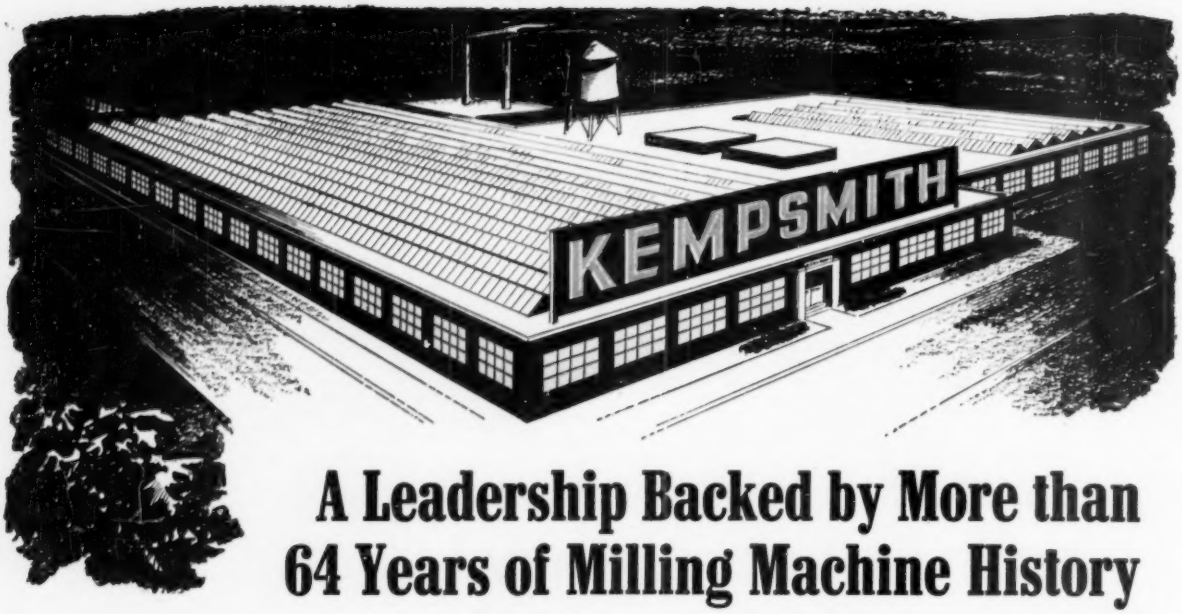
Look Under "Aluminum" in Your Classified Telephone Directory



A Leadership Backed by More than 64 Years of Milling Machine History

Kempsmith Type "G" Plain Miller. All geared for positive power and smooth cutting, free from chatter. Note rugged, streamlined appearance. All controls are grouped within easy reach of the operator. Available in No. 1, 2 and 3 sizes, plain and universal models.

Let the chips fly! Kempsmith Millers have what it takes for tough production battles — built-in ruggedness, increased range of speeds and feeds, greater power. Every machine is precision-built, the product of 64 years of milling machine experience.

Back in 1888, Kempsmith Engineers developed and produced the first Kempsmith Miller — a machine that was destined to achieve world-wide fame. The successful performance of this early model encouraged important engineering improvements and refinements resulting in much greater speed and precision in milling operations. Today, Kempsmith continues as a leader in the industry. The ruggedness, precision and ability to take heavy cuts smoothly make Kempsmith Milling Machines ideal for production, toolroom or general purpose milling. If you have a milling problem, consult Kempsmith. Our engineers will gladly give you the benefit of their broad experience in this specialized field.

THE KEMPSMITH MACHINE CO.
MILWAUKEE 14, WISCONSIN, U. S. A.

KEMPSMITH

• Precision Built Milling Machines Since 1888 •

A-7270-1PG

Powdered Metal Coating Speeds Electrode Welding

Jetweld is a heavily coated shielded-arc electrode for operation in flat or near flat positions with ac or dc welding current. Powdered metal incorporated in coating is said to result in more efficient use of heat of arc.

Unit meets physical requirements of class E-7016, and can be used on work formerly requiring E-6012 and E-6020 electrodes on single- or multiple-pass welds. Said to be particularly suited for horizontal and flat position fillets and laps, single- and multiple-pass butts, deep grooves and corners, cover pass on multiple-pass butts, and for welding some higher carbon steels without cracking or surface holes.

Physical properties are: tensile strength, 93,000 psi; yield point, 79,000 psi; elongation in 2 in., 15 to 22%. Welding speeds in lap and fillet work are on the order of 12 to 15 ipm. Available in 5/32-, 3/16-, and ¼-in. sizes.

Lincoln Electric Co, Cleveland 17, Ohio

Electronic Instrument Checks Ring Gages

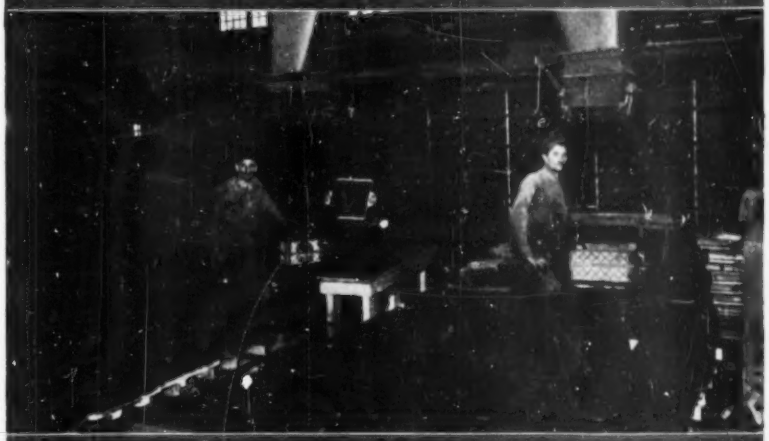
Sheffield bench-type instrument gages the lead, taper, straightness, and concentricity of straight and tapered plain and thread ring gages with up to 8-in. max ID and 10-in. max OD. The unit incorporates a rotating face plate, an electronic pick-up stylus mounted on a vertically adjustable gaging arm, a micrometer screw, and an electronic amplifying and indicating unit. The electronic amplifier has an amplification of 2000:1 and a zero-center equilinear scale directly graduated in half "tenths."

The Sheffield Corp, Dayton 1, Ohio

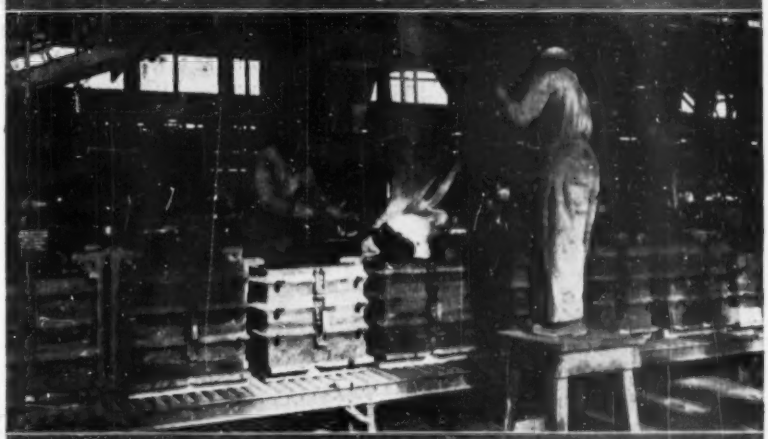
Micro Trip, a two-hand clutch control for manually operated power machines is available as a package for installation on existing presses. Control device prevents tying down or cheating because its two control switches must be pressed simultaneously to operate press; if one switch is pressed before the other, tripping mechanism becomes inoperative and must be reset by a button on the control box. Unit may be used with single switch control and applications where one hand is otherwise occupied, and is particularly applicable for multiple operator installation.

Minneapolis-Honeywell Regulator Co, Micro Div, Freeport, Illinois

IRON AND BRASS CASTINGS



220% FASTER, 30% CHEAPER



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Recent changes in foundry facilities enable Baldwin-Lima-Hamilton to offer you triple savings on iron and brass castings:

1. New squeezer and roll-over machines help Baldwin produce castings so much finer that you can cut out a lot of costly machining required on ordinary castings.
2. Baldwin has been able to reduce casting prices as much as 30% by passing along to you the savings resulting from new automatic equipment and streamlining of pouring operations.
3. By speeding up casting deliveries 220%, Baldwin enables you to reduce costly delays in your production schedules.

Please write Dept. 5902, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa. for further information about the 110 brass and 20 iron alloys available.

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"Automated"

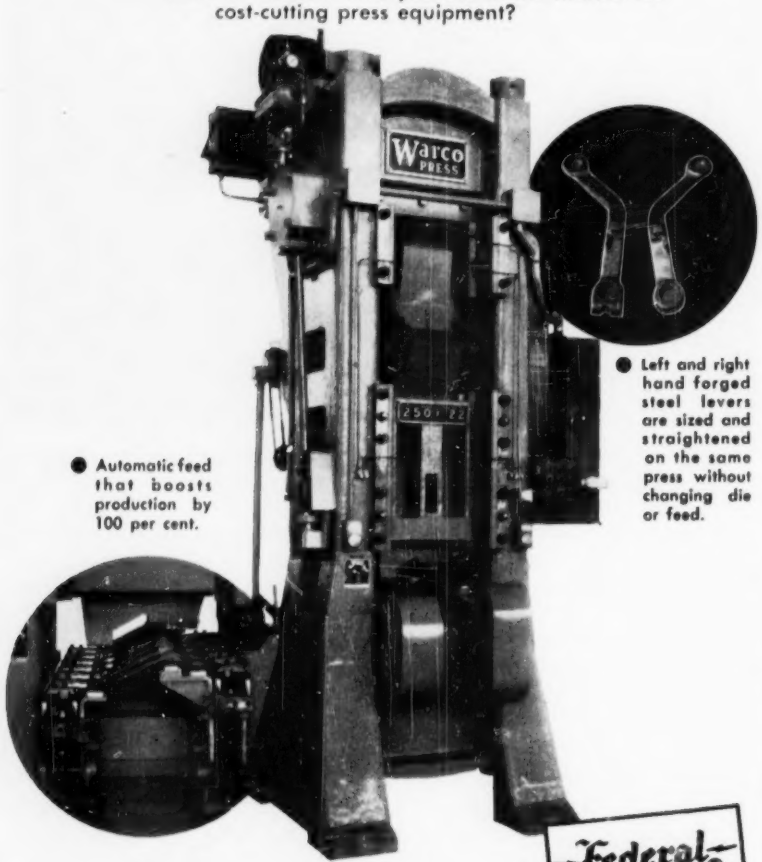
Warco

Coining Press Slashes Sizing and Straightening Costs for Leading Automobile Builder

When a leading automobile manufacturer wanted to cut production costs on a forged steel lever Warco engineers worked with them in designing and building a 250-ton coining press with a chain type feed to automatically size and straighten the levers at a speed of 30 finished pieces per minute.

Front loaded, the press will size and straighten either left or right hand lever without change in dies or feed. It has reduced the production time of this part by more than one-half and has provided a safer, less fatiguing job for the operator.

Warco is constantly working out faster, less expensive and safer press production methods. Why not call them in the next time you are in the market for cost-cutting press equipment?



● Automatic feed that boosts production by 100 per cent.

● Left and right hand forged steel levers are sized and straightened on the same press without changing die or feed.

Federal WELDERS

THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO

Warco PRESSES

Miniature Bearings Available With Single or Double Shield

Miniature Precision Bearings has introduced a new series of single- and double-shielded miniature fractional inch precision bearings of both full race and retainer construction. Bearings, down to 0.1562 (5/32 in.) OD, are available in nine sizes. Single-shield designs are dimensionally interchangeable with MPB standard unshielded types in most sizes; double-shielded series are of slightly increased width over catalog dimensions for standard miniature bearings.

Shields are recessed to avoid interference with shaft shoulders or housings, and are removable for relubrication or inspection. Precision fitting provides a barrier to intrusion of foreign matter and extrusion of lubricant without sacrifice of anti-friction qualities. Series is available in chrome bearing steel and stainless; all shields are stainless.

Miniature Precision Bearings, Inc, Keene, NH

Westinghouse Pit Furnace Cycle Anneals Small Handtools

Westinghouse gas-fired pit furnace cycle-anneals small handtools and can also be used for carburizing, hardening and nitriding. Removable retort makes continuous operation possible since one retort can be discharged and recharged while the other is in the furnace. Maximum operating temperature is 1600 deg. F. Hydraulically-operated furnace cover is suspended from a pivoted arm so it can be easily pushed to either side when raised.

Firing of furnace is completely automatic and combustion blower system is contained for purging and cooling purposes. Instruments for turning off the gas supply in the event of flame failure or low pressure are provided. Furnace is available in five sizes ranging from a charge space of 14 in. in diameter by 18 in. deep with an approximate production rate of 120 lb per hour to 30 in. diameter by 72 in. deep with a production rate of 2100 lb. per hour.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa

Gritcloth is an open-mesh sanding cloth, both sides of which can be used until all abrasive is worn out. Applicable to all metal and paint finishing; can be used wet or dry, flat or folded, by machine or hand.

Bay State Abrasive Products Co, Westboro, Mass

WORLD'S LARGEST
DIRECT DRIVE
BRASS TUBE EXTRUDER

This 2300 ton W-S Extruder was recently designed and manufactured for the American Brass Company, Waterbury, Connecticut.

Now for the first time, all the advantages of direct drive and automatic cycle have been incorporated in an oil hydraulic piercing type extruder . . . without sacrificing speed or cycle time.

This press, designed for the copper and brass industries, has a maximum billet length of 27" and will extrude 60 billets per hour. Press, without runout table, measures 56' long, 12'6" high and 17'9" wide. Total weight is approximately 480,000 lbs.

Let us acquaint you with the complete line of W-S extruders . . . and the advantages of direct drive design.

THE WATSON-STILLMAN COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

163 ALDENE RD., ROSELLE, NEW JERSEY

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The Severance Chatterless Countersink is Engineered for today's fast production schedules. It will give you what you've always wanted in a countersink—
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Take advantage of last minute developments in countersink design—
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Severance CHATTERLESS
COUNTERSINK SET No. 27
Set No. 27 contains a 1/4", 5/16", 1/2", and 3/4" countersink. These sizes will cover a big majority of your countersinking operations. They'll come to you in a specially designed case which closes flat so as to fit in standard tool-box drawers.
Order by Set No. with centerline angle desired, thus: 1 only Set No. 27-41°; 10 only Set No. 27-45°, etc.
SEVERANCE CHATTERLESS COUNTERSINK SET No. 27 including Flat-Wooden Case * $9.50
*Plus 10% in less than 10 Sets.
TOOL NO | BODY DIA. | SHANK DIA | * LIST PRICE
8A | 3/16 | 3/16 | 1.30
CB | 1/4 | 3/16 | 1.30
DC | 5/16 | 1/4 | 1.60
EC | 3/8 | 1/4 | 1.85
GD | 1/2 | 3/8 | 2.40
IE | 5/8 | 3/8 | 3.50
JF | 3/4 | 1/2 | 4.60
KG | 7/8 | 1/2 | 5.75
LI | 1 | 1/2 | 7.00
NJ | 1 1/4 | 3/4 | 10.25
PK | 1 1/2 | 3/4 | 13.65
RL | 1 3/4 | 1 | 17.10
SM | 2 | 1 | 20.50
WHEN ORDERING GIVE: TOOL NO. AND CENTER-LINE ANGLE DESIRED.
THUS: 12 ONLY CB-30°; 24 ONLY GD-41°; ETC.
* PLUS 10% IN LESS THAN 10 OF ANY ITEM
Save Time! Save Money
ORDER DIRECTLY FROM THIS AD
THE Severance LINE ALSO INCLUDES
1/4" SHANK MIDGET MILLS HIGH SPEED AND CARBIDE
TUBE DEBURRING CUTTERS
INSIDE DEBURRING CUTTERS
BALL SEAT REAMERS
CARBIDE HAND FILES
ASK FOR A SEVERANCE CATALOG TODAY!
Severance TOOL INDUSTRIES INC.
726 IOWA AVENUE, SAGINAW, MICHIGAN

Line of tungsten carbide reversible plug gages has been introduced for size range extended beyond the customary 0.510 dia American gage design standard maximum to 0.760 dia. Gaging members are available in tolerance classes XX, X, Y, and Z.

S & E Machine Products, Inc, Bridgeport, Mich

Tantalum, an extremely non-magnetic, corrosion-resistant metal with tensile properties comparable to cold-rolled steel, is being custom-rolled in strip up to 6 in. wide and down to 0.0005 in., to tolerances as close as ±0.0001 in. Available in any quantity from 1 lb to thousands of pounds.

American Silver Co, Inc, 36-07 Prince St, Flushing, NY

Dial indicator, made in Sweden, is available which utilizes a steel band transmission instead of the conventional rack and pinion method. Band transmission can be manufactured with greater accuracy and also functions as a safety device absorbing shocks. Indicators can be furnished graduated in 0.0005 in., and with a range of 0.400 in., equipped with two limit indices, and jeweled bearings.

Imported by Homestrand, Inc, Larchmont, NY

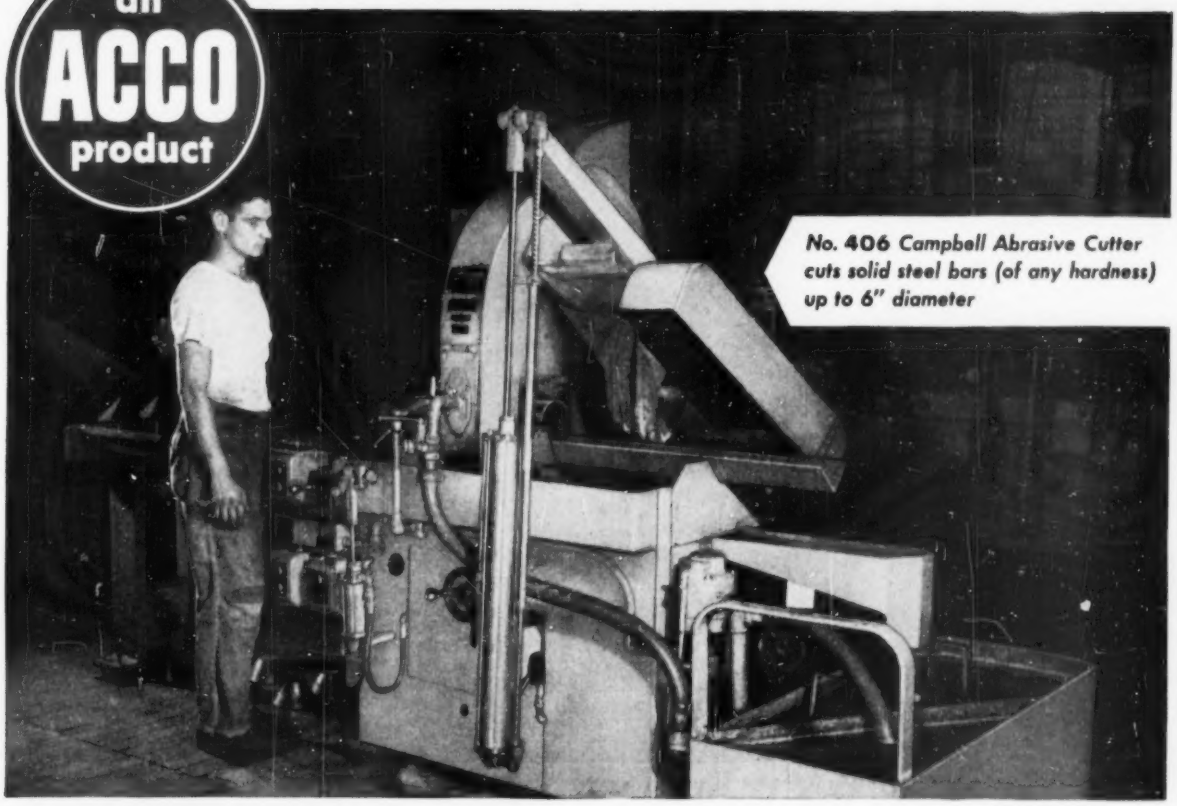
Smoothex bright copper process is said to increase plating production up to 60%; it can be used with present plating equipment. Process saves nickel, eliminates buffing, and has exceptional speed of deposition and excellent throwing power. Brightness is achieved over a much greater range from 0 to 80 amp per sq ft. Ductile deposits and low copper concentrations are features of the process. Periodic reverse or intermitting current may also be applied.

Smoothex, Inc, Cleveland, Ohio

Heavy-duty lens cleaning station is available for welding sections or other heavy-grit areas necessitating cleansing of plastic goggles, safety shields, or any protective surfaces. Can containing 1400 applications of cleaning and anti-fogging fluid is securely locked to a compact steel dispenser which contains no moving parts and feeds inter-folded wiping sheets individually. Dispenser costs $5.95; fluid is $12.50 per carton of twelve 12-oz cans. Each carton of tissues contains 18 refills (760 sheets) at $11.60 per carton.

The Silicone Paper Co of America, Inc, 230 Park Ave, New York, NY

an ACCO product



No. 406 Campbell Abrasive Cutter cuts solid steel bars (of any hardness) up to 6" diameter

CAMPBELL Abrasive Cutting Method Sets New Cut-Off Standards

• Recently CAMPBELL was called upon to cut samples of 8" x 8" No. 8740 Chrome Molybdenum steel each taking 210 minutes the old-fashioned way. The buyer was skeptical of the burn-free, smooth, close-tolerance cuts that took only 18 minutes each on the CAMPBELL NO. 480 which takes work up to 8" square. He insisted on seeing the CAMPBELL Cutter in operation cutting his own steel, which he did at a plant of one of our customers. He was convinced and placed his order for a CAMPBELL 480.

• • •

Perhaps you have cutting problems that can be solved with the speed, accuracy and quality of cuts you can get on a CAMPBELL Abrasive Cutter. If so, let us prove what this remarkable machine will do on your own material. Let us show you before your own eyes.

No matter what hardness or shape of metal you must cut repeatedly, if it will fit on one of many sizes of CAMPBELL Abrasive Cutters, which have a range up to 8" diameter solids and 20" diameter tubular, we'll show you how to cut it faster and better. Write today for "*Principles of Abrasive Cutting.*" Give us the material specifications and we'll be glad to make recommendations.

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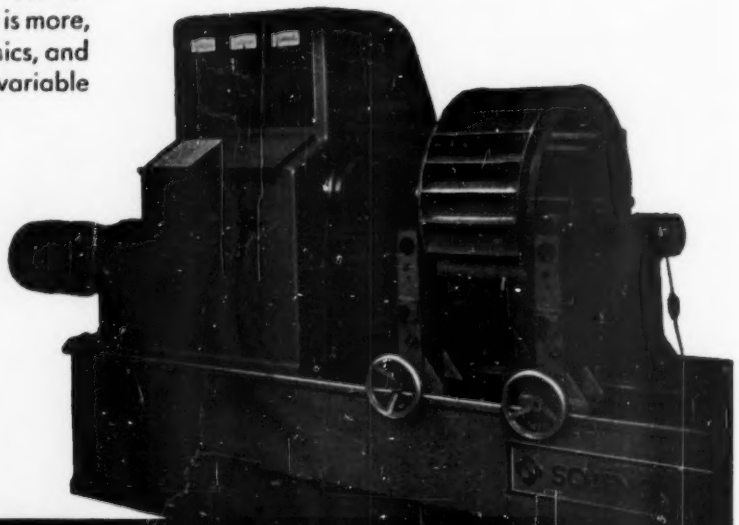
Let the rotor turn, and the wattmeter will show you all the necessary corrections. With this modern measuring principle outlaw oscillations do not affect the indication. What is more, Schenck machines do without electronics, and they are well suited for balancing at variable and high speeds, too.



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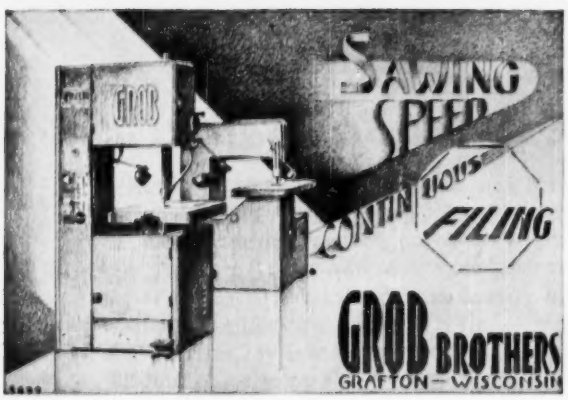

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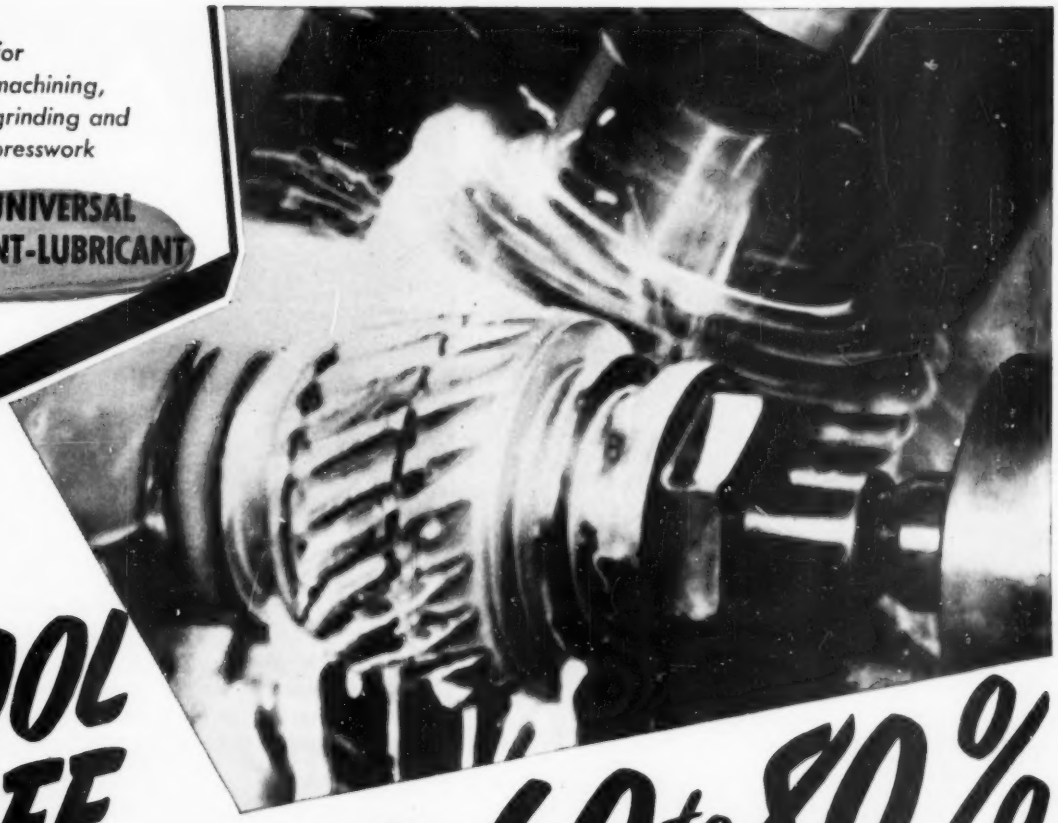

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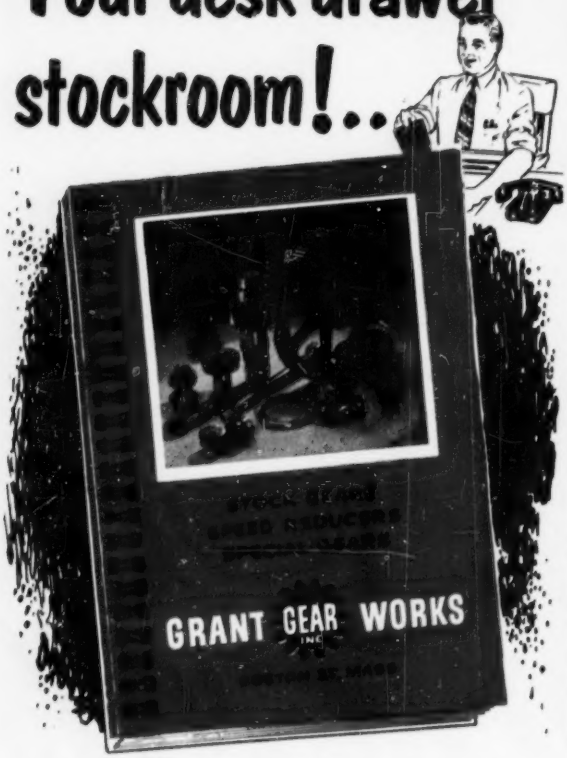

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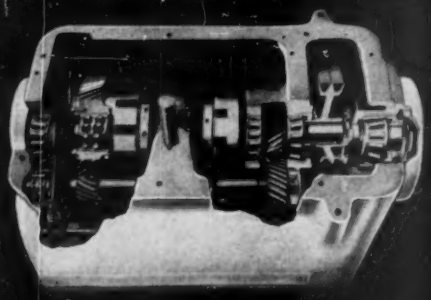

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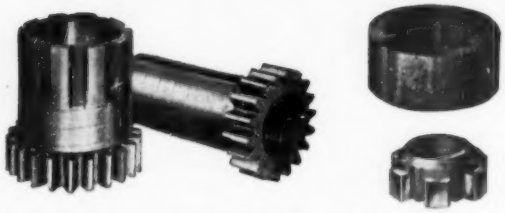

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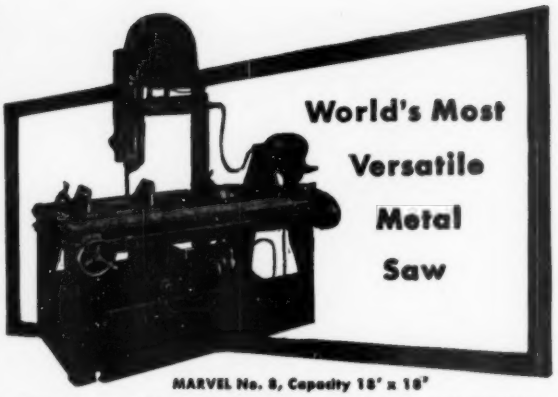

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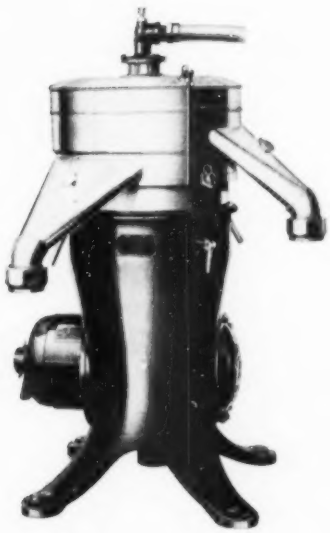

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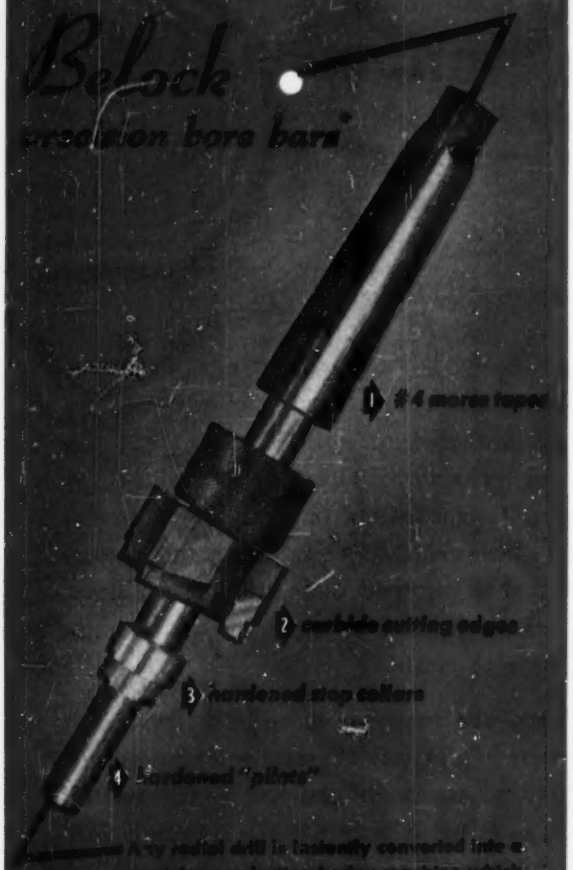
Now every shop can do precision boring with

Belock precision bore bars



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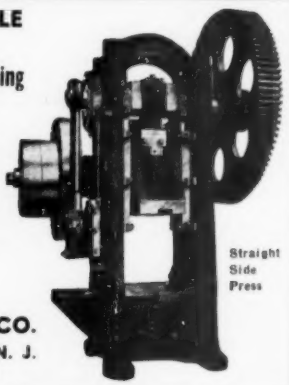

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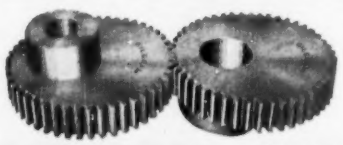

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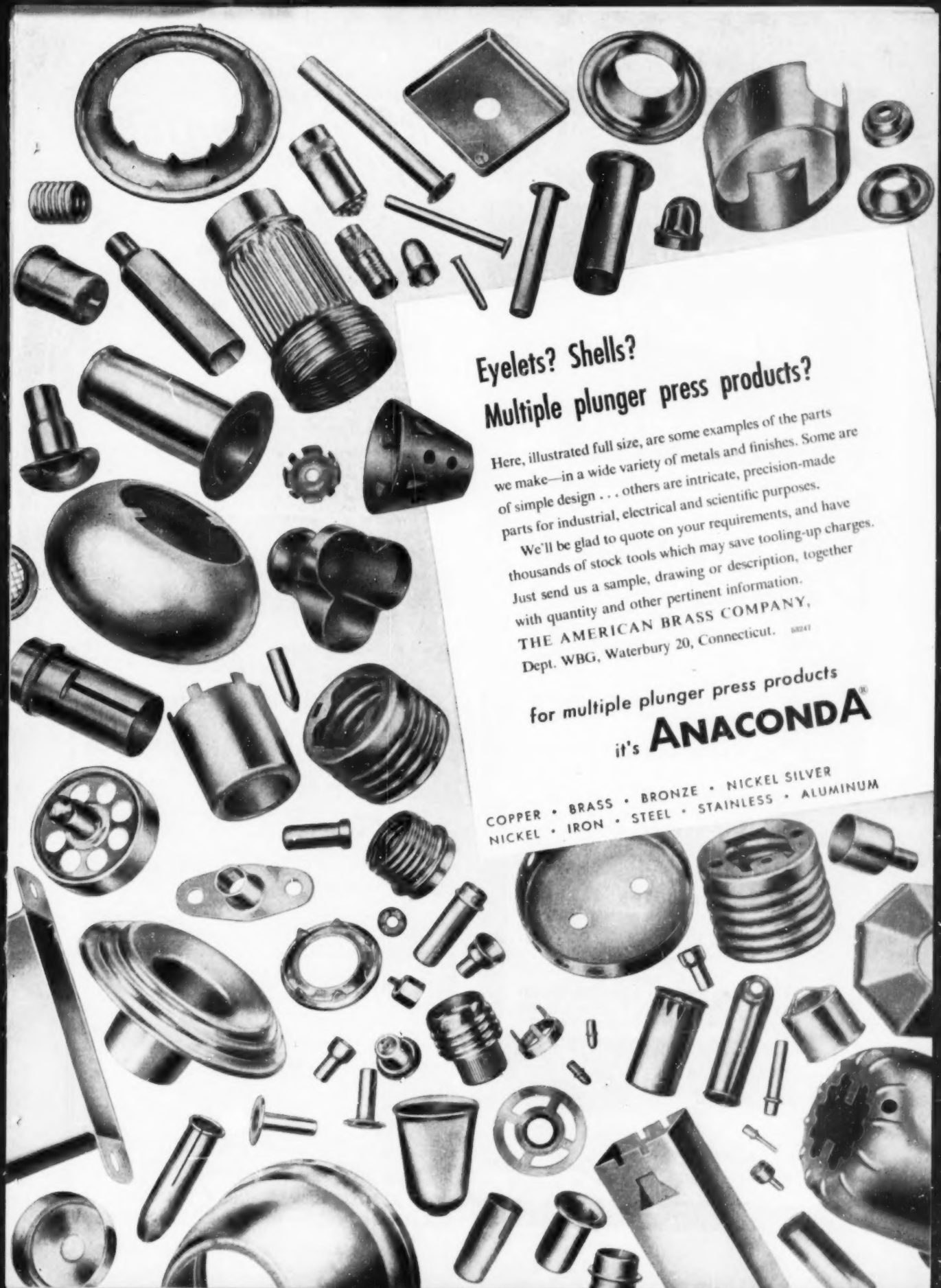

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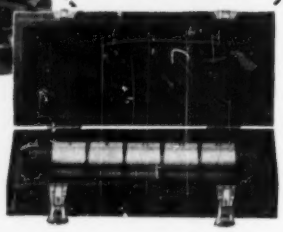

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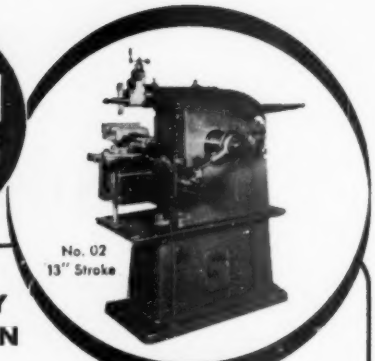

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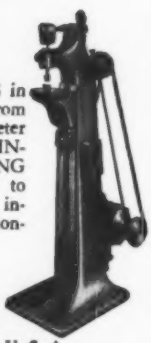

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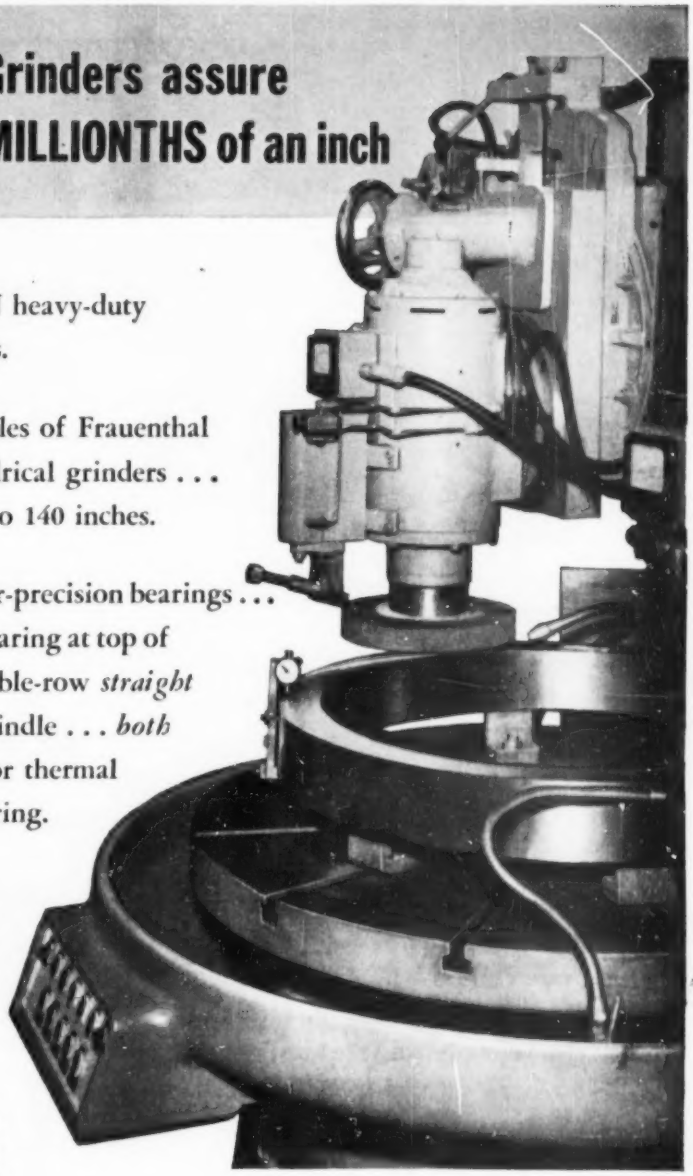
THE GRANT MFG. & MACHINE CO.
85 Sillimon Ave., Bridgeport, Conn., U. S. A.

WHY Frauenthal Grinders assure precision to MILLIONTHS of an inch



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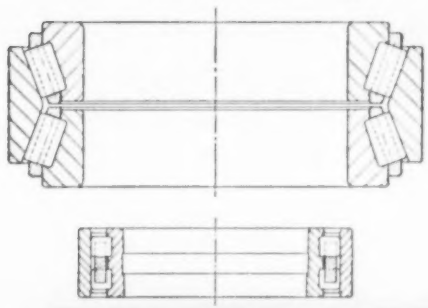

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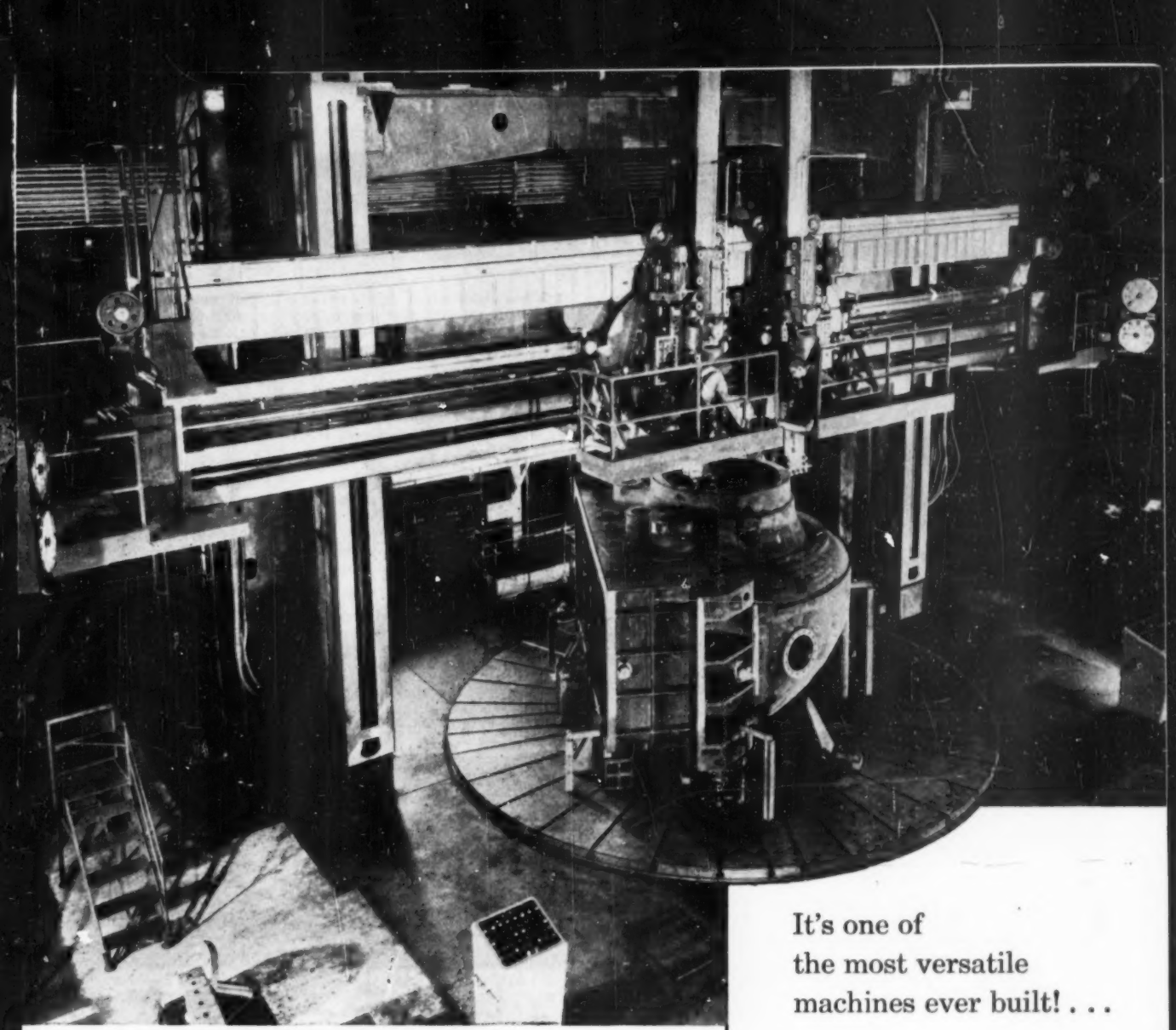

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- ★ Four station electrical control
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Designers and Builders of Centrifugal Machinery

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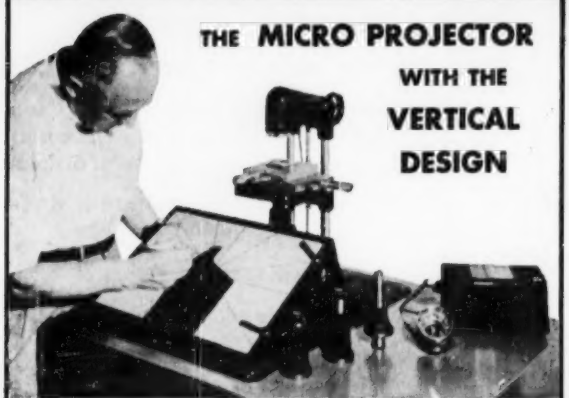

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Give Blood Now

CALL YOUR RED CROSS TODAY!

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Business Executives!

✓Check These Questions!

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- ☐ Do you have a Blood Donor Honor Roll in your company?
- ☐ Have you arranged to have a Bloodmobile make regular visits?
- ☐ Has your management endorsed the local Blood Donor Program?
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- ☐ Was this information given through Plant Bulletin or House Magazine?
- ☐ Have you conducted a Donor Pledge Campaign in your company?
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?

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*Blake Precision Sharpening

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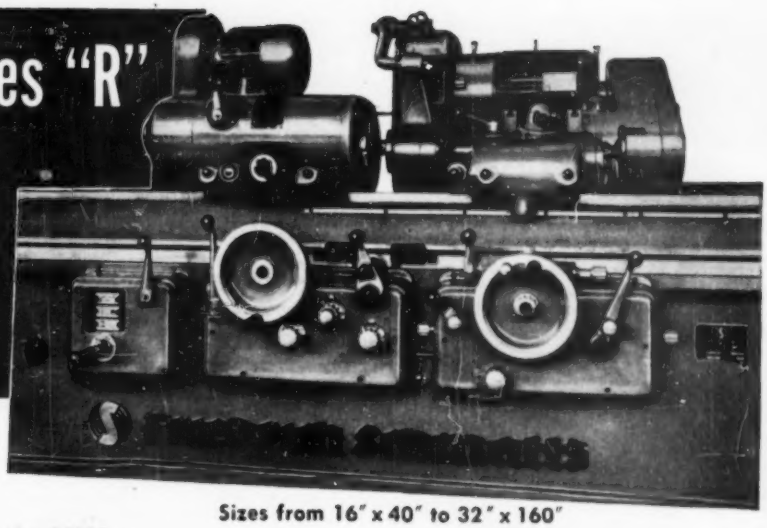

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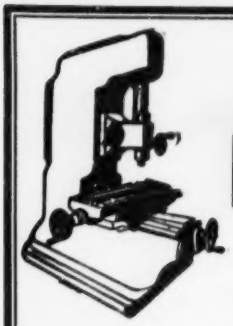

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4DE POTTER & JOHNSTON Automatic Turret Lathe, Motor Driven, T.E.F.C. 7½ HP. 3/60.220/440.

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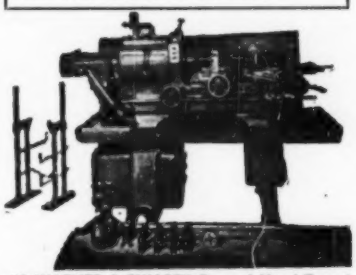

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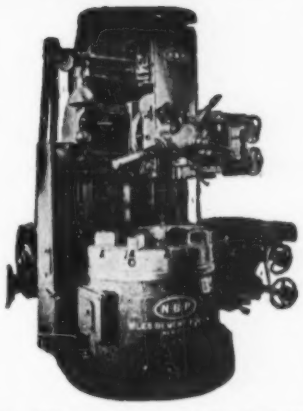
LATHE, Turret #2 W & S Univ. Grd. Hd., Late.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret #5 Warner & Swasey Univ. Late.
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type. Bar Feed. Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret #3A Warner & Swasey Univ. M.D.
LATHE, #901 Outer Hand Turret, M.D., Late Type.
LIFT TRUCKS, 1 & 2 ton, Platform & Fork.

MILL, #1-14 Kent-Owens Hyd. Late Type.
MILL, No. 1 U. S. Hand Mill, M.D. Late.
MILL, No. 1½ Milwaukee Plain Horiz.
MILL, #2 Kempsmith Maximiller Horiz., Vert. Hd.
MILL, #08 Cinc. Vert. Prod. Rotary Table.
MILL, 2M Cincinnati Univ. Horiz. M.D.
MILL, #3B Brown & Sharpe Vertical, M.D.
MILL, #3B Brown & Sharpe Vertical, M.D.
MILL, #3B K & T Horiz., M.I.B.
MILL, #3B K & T Vert., M.D.
MILL, #3VB Hardings Vert. Bench, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cinci. Horiz. #3, #4, High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-8 Cinci. Vert. Prod. Late, M.D.
MULT-MILLER, U. S. Tool #MM-1-6 Auto. Prod.
MILL, No. 0 Brown & Sharpe Plain Horiz.
MILL, #0 Douglas Plain Horiz. M.D., Coolant.
MILL, #0 Sundstrand Rigidmil Hyd., Late Type.
MILL, #0 Vernon Hand Mill, M.D., Late.
MILL, #0-8 Cinc., Horiz. Rise & Fall, Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cinci. Vertical Hi Power, M.D.
MILL, #5C Baker Vert. Die Sinker, M.D.
MILL, 42"x36"x12' Ingersoll Planer Type, 4 hds.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen Electric, 100 K.W.
NIBBLER, #136 Savage 36x3/16" Cap., M.D.
NAILING MACHINE, No. 16—48"-54" Morgan, Late.

THREADING, Staybolt Lassiter Mulholland 1½".
THREAD MILL, 7½x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.



36" x 44" Niles Vertical Boring Mill, Side Head, Motor Driven.

#40A Lees-Bradner Automatic Chucking Thread Mill. Motor Driven, Late Type.

PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x26" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, D72 & DG73 Ferracute, Redraw, M.D.
PRESS, #2½ & #5 Toledo, OBI, Motor Driven.
PRESS, #5 Johnson OBI, 56 tons, new.
PRESS, #7 & #8 Johnson OBI 70 & 90 tons, New.
PRESS, #59½ Toledo Str. Side, M.D., 440 tons cap.
PRESS, 70H & 125PA Drake Hyd. Arbor, New.
PRESS, #78½ Bliss tr. Side, 400 ton cap. M.D.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 60 C Bliss Double Action, 3 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #60 Whitney Deep Throat, 24" throat.
PRESS, P2, P3 Ferracute M.D. Reel feed.
WHEEL PRESS, 600 ton Niles-Bement-Pond, A.C.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1½" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Herker Turret, 8 station, 4½, 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. 1" thru 1".

RIVET SETTER, #140 Chicago M.D., ½" cap.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, #1, #2 Buffalo Forge Vert. Angle Bending.
ROLLS, 72"x¼" Lown Initial M.D., New.

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Radiac "J" DeSanno.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #8 Marvel Bandsaw, 18"x18" cap.
SAW, #4B Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #26-C Racine Shear Cut 6"x6" cap., M.D.
SAW, 10"x10" Racine Hyd., Late Type, M.D., #30C.
SAW, Band Tannewitz GH-36" High Speed, M.D.
SAW, V-26 DeALL Bandsaw, Late.
SHAPER, 16" Newark, Vise, M.D.
SHAPER, 20" Gould & Eberhardt V-ways, Vise, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, 32" Cinci., B.G., Motor Driven, H.D.
SHAPER, Morton, 36" Draw-Cut, 4 speed M.D.
SHEAR, 6' x 14 ga. Parker M.D., Late Type.
SHEAR, #26 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SCREW SLOTTER, #2 Waterbury Farrel Auto.
SLOTTER, 12" New Haven Vertical M.D.
SPOTTER & SCROPER, Anderson Power Unit, Late.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap., M.D.
SURFACE PLATES & TABLES, all sizes.
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TAPPER, #1 Bakewell (Warner & Swasey) Late.
THREAD ROLLER, #20, #30 Waterbury Farrel.
TRUCK, 2000 lbs. Hyster Fork Lift 9' Model GY-20.
TRUCK, 4000 lbs. LT-44 Towmotor Fork, Lift 9'.
BRINELL TESTER, Type 03DR. Steel City.
WELDER, 300 amp. Westinghouse Flexers A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
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WIRE STITCHER, Morrison & Acme, M.D

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13. Oxy-acetelevne profile cutting machines.
14. Material cutting and filing machines.
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Tender forms, as well as "Instructions to Tenderers (Bidders), and "Conditions of Contract" may be purchased from Messrs. SWISS CAR AND ELEVATOR MANUFACTURING CORPORATION LTD., SCHLIEREN-ZURICH (Switzerland) at a ground rate of SFr. 5.—and an additional rate of SFr. 10.— per machine group, payable to the Credit Suisse Zurich (Switzerland) for account Swiss Car and Elevator Manufacturing Co., Ltd., Schlieren-Zurich. Tender forms can also be obtained from the Director, India Supply Mission, 635 'F' Street, Washington, D. C. after payment of dollar equivalent of Swiss Francs indicated above.

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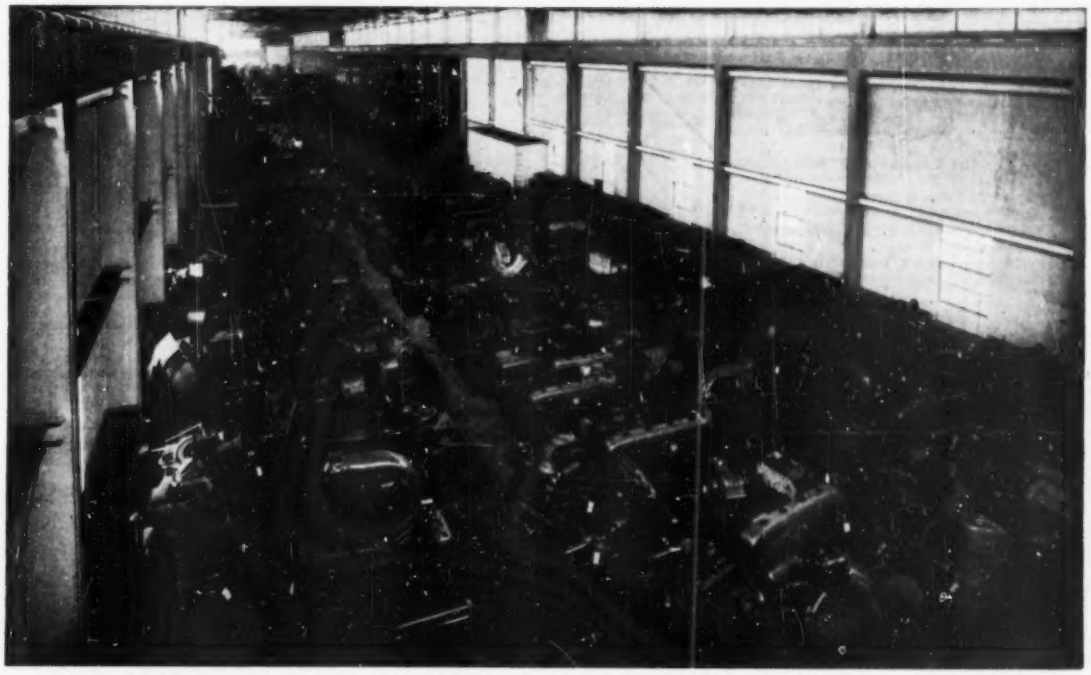

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14"x30" centers Bradford, timken
12" Bradford, 14½" swing x 30" centers, Timken
12"x6' Lodge & Shipley Geared Head, m.d., taper
13"x54" centers LeBlond Geared Head, m.d., taper
13"x5' bed Willard, cone, motorized
14"x6' American High Duty Geared Head, m.d., taper
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14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Lodge & Shipley, cone, motorized
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' LeBlond, Geared Head, s.p.d.
14"x6' bed Monarch, cone, motorized
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Sidney Geared Head, m.d.
14"x8' Prentice, m.d., taper
16"x30" centers Monarch, m.d., taper
16"x6' bed Cisco Geared Head, m.d.
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' Lehmann Geared Head, m.d.
16"x6' Lodge & Shipley Selective Head, m.d.
16"x6' Lodge & Shipley, cone
16"x6' bed Monarch Geared Head, m.d.
16"x72" American Geared Head, m.d.
16"x84" Pratt & Whitney Type B, m.d.
16"x8' bed Reed-Prentice, cone, taper
16"x8' Monarch, cone, motorized
16"x12' bed LeBlond Geared Head, m.d., taper
17"x6' LeBlond Geared Head, m.d.
18"x5' LeBlond Geared Head, m.d.
18"x6'6" bed Greaves-Klusman Geared Head, m.d.
18"x7' Hendey Geared Head, m.d., taper
18"x8' bed American Geared Head, m.d.
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley Geared Head, m.d.
18"x8' Whitcomb-Blaisdell Geared Head, s.p.d.
18"x8'6" bed Waicott, cone, motorized
19"x6' bed LeBlond Geared Head, m.d., later type
19"x10' bed LeBlond H.D., m.d.
19"x10' bed LeBlond H.D., m.d.
19"-38"x10' bed LeBlond Gap Lathe, cone, motorized, taper
20"x8' bed American Geared Head, m.d., taper
20"x8' Cisco, cone, motorized
20"x8' bed Greaves-Klusman Geared Head, m.d. in leg
20"x8' bed Boye & Emmes, m.d.
20"x8' bed Lodge & Shipley Geared Head, m.d., taper, later type
20"x10' bed (6' centers) Sidney Geared Head, m.d., taper
20"-40"x8' bed Rahn-Larmon Gap Lathe, cone, motorized
20"x10' Sidney Geared Head, m.d.
20"x10'6" Boye & Emmes, cone, motorized
20"x10'6" bed Sidney "Tritrol" Geared Head, m.d., late
21"x8' bed LeBlond Geared Head, m.d., taper
23"x12' LeBlond Geared Head, m.d., taper
23"x12' bed LeBlond, cone, motorized
24"x12' bed Boye & Emmes, belt drive
18/27"x8' Nobel Removable Block Gap Series LN Geared Head, m.d.
24"x7' centers American, m.d.
24"x12' Bridgeford Geared Head, m.d., taper
24"x16' bed Lodge & Shipley, cone, motorized, taper
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25"x10' bed LeBlond Geared Head, m.d., taper
27"x24' bed American Heavy Duty Geared Head, m.d., taper, late type
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36"x16'6" bed Boye & Emmes Geared Head, m.d.
36"x16' Putnam, m.d.
42" Putnam raised to swing 58½ x 20' bed Geared Head, m.d., 11'8" centers
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No. 4 Cincinnati High Power Universal, a.c. m.d., div. hds.

No. 4-B Brown & Sharpe Heavy Plain, ac.c. m.d., all geared

No. 3-B Brown & Sharpe Heavy Plain, ac.c. m.d., all geared

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No. 1-14 Kent-Owens Hydraulic, a.c. m.d., #40 taper, new 1941

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No. 3-A Warner & Swasey Saddle Type, a.c. m.d., 4¼ spindle, Timken, covered ways, taper attachment, screw chasing attachment, p.r.t. tooling

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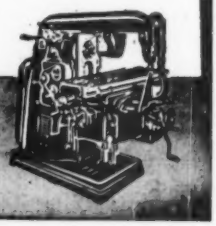

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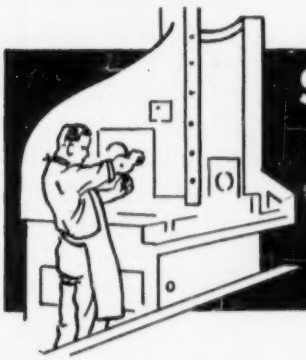

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42"x15' AMERICAN Heavy Duty Lathe

42"x25' centers AMERICAN Heavy Duty Lathe

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No. 172 HEALD Gap Internal Grinding Machine for large swing

6"x18" LANDIS Type C Plain Grinder

10"x72" LANDIS Type C Hydraulic Plain Grinder —1942

12x18x40 THOMPSON Type "B" Surface Grinder —1951

Nos. 4D and 6S POTTER & JOHNSTON Automatic Lathes

1L GISHOLT Turret Lathe, 1952

Nos. 8A and 9A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes

No. 2 CINCINNATI HS Dial Type Plain Millers

No. 0-8 CINCINNATI Plain Milling Machines

No. 2M CINCINNATI Vertical Miller, 1941

No. 1-18 CINCINNATI Plain Mfg. Miller

No. 12 B&S Plain Bed Type Production Miller

6"x60" P&W Model C Thread Miller

Nos. 64 and 72 FELLOWS High Speed Gear Shapers

No. 12 FELLOWS Gear Shaver 1943

No. 36BM GOULD & EBERHARDT Gear Roughers

16/20" GOULD & EBERHARDT Industrial Shaper

36" OHIO "DREADNAUGHT" H.D. Shaper.

100" BETTS Vertical Boring Mill, 2 heads.

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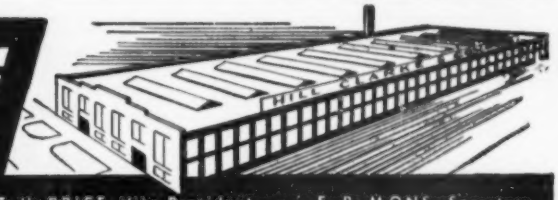

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Partial List

Automatics

1-1/16" Cleveland Model A (1942).

Boring Machines

No. 45—4½" Gidd. & Lewis Hor. Bar.
100" Niles-B-Pond Vert. Bor. Mill. (1934).

Drills

No. 2 Avey Cam Fd. Drill. 14" Swing.
2 Spdl.—24" SW.—No. 3 Avey.
D-31 Fox Multiple.
1 Spdl.—30" Sw. No. 4 Taper Aurora.

Gear Machines

11" Gleason Gear Generator.
No. 12HS Gould & Eberhardt.
No. 36-BM G. & E.—3 spdl. Rougher.
615-A Fellows Gear Shaper.
612-A Fellows Gear Shaper.
No. 64 Fellows Gear Shaper.
8" Red Ring Gear Lapper.

Grinders

6" x 18" Landis Type C (1942).
6" x 18" Norton Type C Plain (1943).
10" x 36" Norton Type C Grinder.
10" x 36" Norton Type C cam geared.

Internal Grinders

No. 1109 Bryant Internal Gdr. (1951).
No. 5 Bryant Internal Grinder.
No. 5B Bryant Internal Grdr.
No. 16-16 Bryant Int. Grinder.
No. 16A-16 Bryant Internal Grinder.
No. 16-28 Bryant Int. Grinder.
No. 16 A-28 Bryant Internal Grinder.
No. 24-26 Bryant Int. Grinder.
No. 24-36 Bryant Internal Grinder.
No. 81 Heald Internal Centerless.

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Model H-2 Micromatic Horiz. Hone.
Model 200-H5-Dbl. End Micro. Horiz.
Model H-7 Micromatic Vert. Hone

Lathes

R-14 Lo Swing Automatic Lathe.
18" x 6' Am. Geared Head Lathe.
18" x 8' Lodge & Shipley Grd. Hd.
27" x 12' American Geared Hd. Lathe.
27" x 12' centers LeBlond Lathe.
36" x 18' Putnam Grd. Hd. M.D.

Turret Lathes

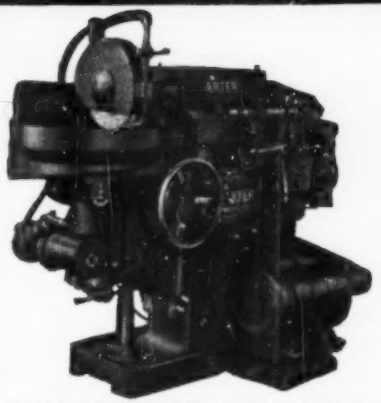
No. 5W Acme Tur. Lathe (Late).
No. 3AL Gisholt, Cross-Slide Turret.
No. 4A Warner & Swasey Turret.
No. 6 Warner & Swasey, cone head.
2¼" x 24" Jones & Lamson.
18" Libby, M.D.
No. 4A Warner & Swasey (1944).
No. 4A Warner & Swasey, Taper, Cross-sliding Turret (1942).

Planers

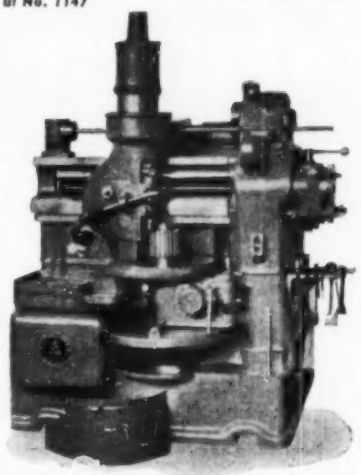
48" x 36" x 14' Gray, 2 Heads.
48" x 48" x 12' Cincinnati, 2 Heads.
60" x 48" x 27' American, 4 Heads.

Milling Machines

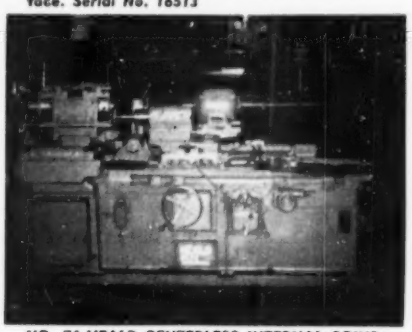
54" Ingersoll Vertical Adjustable Rotary Mill.
No. 3K Milwaukee Vert. Mill (1942).
No. 08 Cincinnati Vert. (1942).
4" Taylor & Fenn Duplex Spline.
6" x 168" Pratt & Whitney Thrd. Mill.
10" x 48" Hanson-Whitney Thrd. Mill.
10" x 60" Pratt & Whitney Thrd. Mill.
12" x 102" Lees Bradner Thrd. Mill.
54" x 30" x 16' Ingersoll Slab Mill.
No. 34-36 Cincinnati Hydro.



No. A3-12 ARTER ROTARY SURFACE GRINDER 7½ Hp. A.C. Main Motor: Rectifier: Demagnetiser; Swings 20" with 13" diam. Chuck. Serial No. 7147



No. 615A Fellows Gear Shaper, 3 HP. A.C. Motor-in-base, capacity 18" Pitch diam. x 5" face. Serial No. 16513



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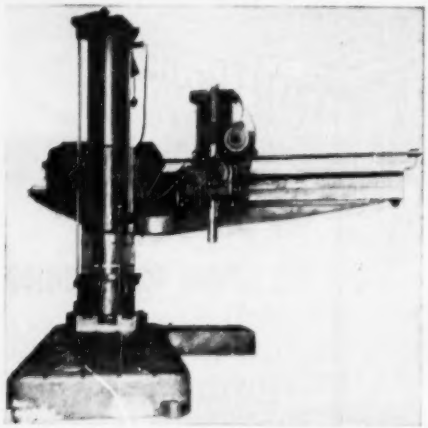

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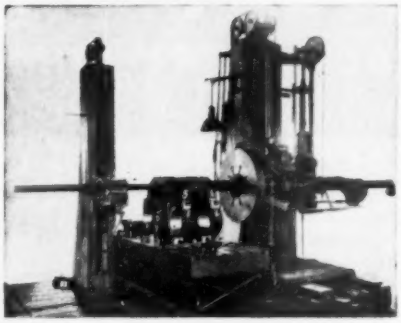

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HP-100 LaPointe Horizontal Hydraulic Broach. 1945.
No. 7 Gleason "Revex" Gear Rougher. 1943.
16"x72" Norton Univ. 1942.
No. 35 Excello Precision Thread Grinder.
No. 2 Cincinnati Centerless Grinder. 1944.
24-36-Bryant Hydraulic Internal Grinder. 1942.
No. 72A3 Heald Plain Hydraulic Internal Grinder. 1941.
No. 24 Mattison (Hanchett Type) Duplex Grinder.
No. 16A Blanchard Automatic Surface Grinder. 1942.
No. 6DRE Potter & Johnston Automatic. Late.
1" RA-6 Nat. Acme Automatic 1941.
No. H5 Libby Universal Saddle Type Turret Lathe. 1939.
No. 3R Gisholt Universal Saddle Type Turret Lathe. 1942.
No. M-18 Kearney & Trecker Simplex Mill. 1943.
650 Ton Verson Double Action Eccentric Press. 1940.

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KEARNEY & TRECKER 2H, Univ., D.H., 1942
KEARNEY & TRECKER, 2H, 1942
KEARNEY & TRECKER, 1H—18, mfg. new 1943
DEFIANCE, Duplex Hyd., 18"x48" table, timk.

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CINCINNATI 14"x36" Univ. Cyl., 1945.
HEALD, 75A, Internal
LANDIS, 16"x42", Hydraulic Crankshaft.
MATTISON, 14"x16"x48", surface, check. 1944
EXCELLO 33-L, precision thread, new, 1943

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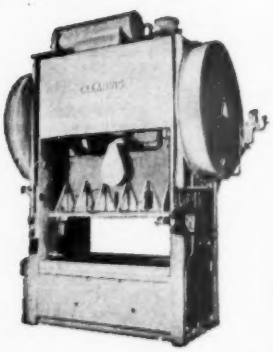

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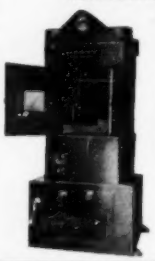

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LATE TYPE MACHINERY IN EXCELLENT CONDITION

ENGINE LATHES

14"x30" Hendey, taper att. 1942
16"x54" Lodge & Shipley, Taper Att. Tool Room Lathe, Relieving att. 1947
18"x48" Monarch—1946
20"x48" American—1940
20"x96" Sidney—1932
20"x96" Lodge & Shipley, taper att. 1941
20"x60" Reed Prentice, Geared Hd. 1925
24"x12' Monarch, Timken Bearing—1933
25"x96" Monarch, 1942, well tooled
24"x168" Monarch, Rapid Tra. 1942
36"x18' LeBlond, Geared Hd.
36"x18' Lodge & Shipley, Geared Hd.
54"x18' Houston, Stanwood & Gamble, 1920

TURRET LATHES

2—No. 3 Gisholt Univ. Ram Type Chucking, 1944
No. 4 Gisholt—1944
No. 4 Warner & Swasey Univ. Bar & Chuck
No. 5 Warner & Swasey—1942
3—No. 5 Gisholt, Pre-selector—1943
No. 1L Gisholt, Bar and Chuck—1932-42
No. 3L Gisholt, Bar & Chuck—well tooled—1942
No. 1A Warner & Swasey, Pre-selector, & Chuck well tooled, 1945
No. 2A Warner & Swasey, Pre-Selector, & Chuck well tooled, 1943
No. 2H8" Libby—8¼" hole in spindle

PRODUCTION LATHES

8"x108" Lo Swing—1947
15"x30" Lipe Carbo-matic—1942
20"x25" Fay—1948
No. 8 Sundstrand, front and rear cross slides & tailstock—1940
No. 16AL LeBlond—1940

VERTICAL BORING MILLS

24" Bullard—1926
42" Bullard—1928
54" Bullard—1930
62" Bullard—1933

MILLING MACHINES, PLAIN HORIZ.

No. 2H Kearney & Trecker—1943
No. 3H Kearney & Trecker—1943—w/Vert. Head
2—No. 3K Kearney & Trecker—1943
No. 3 Cinn. High Speed Dial Type—1943
No. 4K Kearney & Trecker—vert. head, tooling—1943

MILLING MACHINES, PRODUCTION

No. 1248 Kearney & Trecker—1942
No. 1854 Kearney & Trecker Simplex Prod. —1943
No. 4-48 Cinn. Hydromatic Mill, 1940
No. 1402 Kearney & Trecker—1932
No. 1403 Kearney & Trecker Timken—1932
No. 2204 Kearney & Trecker Simplex Prod. —1932
36-72 Cinn. Horiz. Hydrotel—1942
56-72 Cinn. Hydromatic Duplex — 1942 widen pattern

MILLING MACHINES, UNIVERSAL

No. 2K Kearney & Trecker, Vert. Hd. dividing hd. tailstock, rotary table, misc. tooling and elec. 1943
No. 4AFU Universal Mill, dividing hd. tailstock, arbors, & Elec. NEW

MILLING MACHINES, VERTICAL

No. 3 Cinn. Vert. Dial Type, 1942
No. 4H Kearney & Trecker Vert. 1941
No. 3V Van Norman Vert. 1942
No. 4 Cincinnati Vert. Dial Type—1941

GRINDERS, CYLINDRICAL

6"x18" Norton Plain—1940
6"x30" Landis Type C Hyd. 1941
10"x36" Norton Type C Plain—1942
10"x48" Norton Type CD Plain Hyd. Plunge Cut—1942
14"x48" Cinn. Plain
10"x50" Norton, Older

GRINDERS, INTERNAL

No. 72A3 Heald Extended Bed, Int. 1943
No. 24-26 Bryant Int.
No. 75A Heald—1942

GRINDERS, SURFACE

6"x18" Thompson Horiz. Sur. Type F 1942
8"x24" 3B Abrasive Sur. 1943
84" Lumsden Vert. Rotary Sur. 1940

GEAR HOBBERS

Type A Barber Colman 84" extended Bed—1937
8H Gould & Eberhardt
16H Gould & Eberhardt

GEAR SHAPERS

No. 61 Fellows Gear Shaper—1943
No. 61A Fellows Gear Shaper—1943
No. 645A3 Fellows 1943
No. 7125A Fellows 1953
No. 725A Fellows 1943

PRESSES

No. 426½ Hamilton Dbl. Crank—150 ton cap., 10" stroke, 42"x38" bed
No. 665 Toledo Knuckle Joint—1934
300-Ton HPM Fastraverse Hyd.

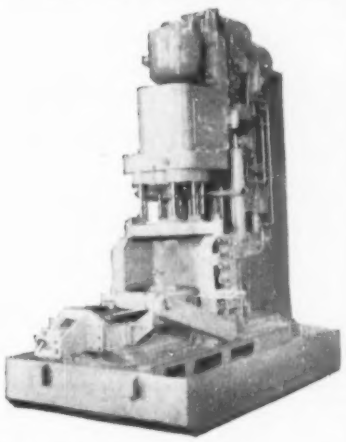
DRILLS

3'11" Carlton Radial—1941
4'11" Cincinnati-Gilbert—1942
4'11" Carlton Radial—1951
4'15" Carlton Radial—1941
5'11" Carlton Radial—1941
5'15" Carlton Radial, DC motor drive on arm, 1930
H4 Barnes Hydram Hyd. in and out table—1944
No. 36HO Baker Hyd. in and out feed table—1944
No. 242 Barnes Q.C.G.—1927
4B12 Edlund 4-Spindle Drill—1940
4' Hammond Drill & Tapper—1943

MISCELLANEOUS

2-5¾" Cleveland Single Spindle Auto. Screw Mach. with vert. slide, bar feed, 1941
24" Rockford Hyd. Shaper—1943
12" 6-Spdl. Bullard Type D Multimatic—1943—Power Chucking
No. 47A Heald Boremetic with 2 Heald Red Heads—1942
2—100,000 lb. Tinius Olson Testing Machine
Ingersoll 5-Spdl. Rotary Drum Type Mill
#2 Cinn. Centerless Grinder, 1942
#3 Cinn. Centerless Grinder, 1942
2—84B Natco Multiple Drills, Rectangular heads, 1944

BAKER MODEL 36-HO DRILL



H.P. Main drive to heads—20
Maximum feed pressure—23,500 lbs
Maximum saddle travel—24"
Width of ways 15"
Center main spindle to face of frame 18"
Saddle length 40"
Complete with 20 H.P. motor for driving spindles
Fixed head
9 spindles
Air operating shuttle table
Positive stop and delay reverse mechanism
Buffalo 40 gal. auto lubrication system
Coolant system
3 H.P. Hydraulic Motor

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⅝" No. 0 Brown & Sharpe Automatic
1¼ and 1½" 8 spindle Conomatics
2¼" cone 4 spindle Automatic
8" Bullard 6 spindle Multi-Automatic

BROACHES

No. 1 Foote Burt Duplex vertical surface
10 ton 48" stroke American Horizontal hydraulic
10 ton 56" Oilgear Model 3Ax horizontal
12 ton V2 American vertical hydraulic
15 ton 36" stroke Colonial vertical
18 ton V42 American vertical hydraulic

DRILL PRESSES

20" and 24" No. 217 Baker heavy duty
24" No. 321 Baker heavy duty
Natco double end horizontal, 2 way
12 spindle No. 12 Natco multiple
22 spindle No. 14 Natco multiple
34 spindle No. A16 Natco multiple
30" swing Allen power feed sensitive
20", 21" and 24" Cincinnati upright
No. 36HO Baker vert. hydraulic drilling and boring
No. 15½ Foote Burt hydraulic vertical
No. B250H Natco hydraulic vertical

GEAR HOBBERS

No. 3 Barber Colman
No. 12H Heavy Gould & Eberhardt universal
16" Cincinnati spur and spiral
8"-10" No. 1 Lees Bradner
No. 7S Lees Bradner
No. 12 Barber Colman
Type A Barber Colman universal

GEAR MACHINERY, Miscellaneous

Red Ring gear shaver
No. 71A, No. 75A, No. 712 & No. 715 Fellows shapers
No. 60 Cross gear tooth rounder
100" x 24" Newark No. 7
8" Red Ring gear lapper
10" Pratt & Whitney hydraulic gear grinder

GRINDERS

No. 2 Cincinnati centerless, plain and Filmatic bearing
10" x 18" Norton cylindrical
10" x 18" Cincinnati Filmatic bearing
10" x 36" Norton cylindrical
16" x 72" Norton cylindrical
16" x 96" Landis cylindrical
16" x 96" Landis gap type cylindrical
No. 120A Gardner opposed spindle disc, 20"
23" No. 84 Gardner opposed spindle disc
53" No. 24A Gardner horizontal disc
72" No. 179 Gardner horizontal disc
30" No. 8 Badger double disc motor on spindle
No. 72A3 Heald plain hydraulic internal
No. 72A3 Heald Gagematic internal
No. 72A3 Heald Sizematic internal
No. 5 Bryant internal
No. 16A Bryant 2 spindle hole and face
24-36 Bryant internal hole
8" x 22" No. 3 Abrasive surface
12" x 48" Model 300 Hanchett surface
8" x 24" No. 5 Brown & Sharpe surface
No. 4T Sellers tool grinder
Cincinnati face milling cutter grinder
No. 3 Barber Colman hob sharpener
38" Covel Hanchett Model GK-36 knife grinder

MILLING MACHINES

No. 3 Sundstrand Rigidmill production
12" Cincinnati plain manufacturing, also 18"
24" Cincinnati duplex automatic
4—36 Cincinnati Hydromatic production
4—48 Cincinnati Hydromatic production
4 Burt universal floor type mill
No. 2 Cincinnati high speed dial type plain
No. 1 Milwaukee vertical mill
No. 2B and 3K Milwaukee universal
No. 3B and 4K Kearney & Trecker plain
8" x 16" Hanson Whitney thread mill
Model CT-36 Lees Bradner thread mill
8" x 18" Hall Planetary thread mill

SHAPERS

16" G & E inexpensive
16" American
16" Heavy pattern American Auto-oiled
24" Cincinnati
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Universal No. 24 Tri-Way—3" bar—Table 26"x52"—MD
Giddings & Lewis No 0—3⅛" bar—Table 24"x50"—MD
(NEW) Model AF-95—3¾" bar—Table 31½"x47¼"—MD

DRILLS

Leland-Gifford No. 2LMS 3-spindle—2 hydraulic & 1 hand feed spindle—Late type
Leland-Gifford No. 2LMS 6-spindle—4 power feed and 2 hand feed spindle—Late type
Carlton 3'13" Radial — Motor-on-arm — Electro-Hydraulic column clamp—Late type

MILLERS

Milwaukee No. 3K Plain—Range 34"x12" x18"—Table 14"x64"—No. 50 taper—MD—Late type
Cincinnati No. 4 Plain—Rectangular over-arm—Vertical head—No. 50 taper—MD
Milwaukee No. 3H Universal—Range 34"x 12"x17"—Dividing heads — MD — Late type
Cincinnati No. 4 Vertical Dial Type—Range 42"x16"x16"—No. 50 taper—MD—Late type

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28"x15' centers **BERTRAM** (Niles patterns) "Timesaver" Engine Lathe, 2 carriages, rapid traverse, AC-MD, new 1943
36"x12' centers **AMERICAN** Heavy Duty 16 Speed Geared Head Lathe, AC-MD
60"x20' **NILES-BEMENT-POND** Geared Head Engine Lathe, rapid traverse
No. 1L **GISHOLT** Saddle Type Universal Turret Lathe, preselector head, bar feed, chuck, new 1943
No. 1A **WARNER & SWASEY** Universal Turret Lathe, Timken spindle, electric chuck
No. 2A **WARNER & SWASEY** Universal Turret Lathe, preselector head, bar feed, chuck, new 1943
No. 3A **WARNER & SWASEY** Turret Lathe, Timken spindle, electric chuck, tooling
No. 2 **VAN NORMAN** Plain Horizontal Mill. New 1943
No. 2CH **KEARNEY & TRECKER** Vertical Mill, new 1951
No. 3-24 **CINCINNATI** Plain Hydromatic Mill, AC-MD
No. 4 **KEARNEY & TRECKER** Plain Horizontal Mill, No. 50 taper, motor in base, rapid traverse
No. 4 **CINCINNATI** High Speed Dial Type Plain Horizontal Mill, new 1942
No. 4 **CINCINNATI** High Power Dial Type Vertical Mill, 25 HP motor, new 1951
No. 4H **KEARNEY & TRECKER** Vertical Mill, new 1944
3¾" bar **LUCAS** Table Type Horizontal Boring Mill, vertical milling attachment
48"x48"x10' **NILES** Double Housing Planer, box table, DC reversing motor drive.
48"x48"x12' Cincinnati Double Housing Planer, power rapid traverse, DC reversing motor drive, box table, forced feed lubrication.
48" widened to 69"x12' **DETRICK & HARVEY** Double Housing Planer, box table, DC reversing motor drive
No. 2 **BROWN & SHARPE** Surface Grinder, motor inside base, power feeds
25A Heald Rotary Surface Grinder, 24" diameter magnetic chuck, AC-MD
1½" **LANDIS** Bolt Threader, leadscrews, AC-MD
30" **MORTON** Hydraulic Keyseater, new 1942
600 Ton **CHAMBERSBURG** Wheel Press, cast steel frame, inclined, AC-MD
3'9" Column **AMERICAN** Radial Drill. AC Motor on arm. New 1943.

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No. 55 Bliss Consolidated S.S.S.C., equipped with side shear, 4" str., M.D.

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Brown & Sharpe (1) Model 2G, 1¼" capacity.
Brown & Sharpe (8) Model 0G, ⅝" capacity.
Brown & Sharpe (4) Model 00G, ⅜" capacity.
Brown & Sharpe #4 Automatic New 1939
Ceco Screw Machine ⅜" capacity.
Cleveland Model AA-11, Serial #36586.
Cleveland Model B. Serial #42618/843.
Cleveland B18—1½" Cap. Late.
Conomatic 4 Spindle, Serial #2309FF, 1½".

BORING MILLS
Bullard 24" V.T.L. Spiral Drive
Bullard 8"—8 spindle, Multi-Matic
Cleveland 2½" Bar Capacity, Defiance 3¾" Bar
Giddings & Lewis #32, 3" #25, 2½" Bar.
Kings 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vertical
New 3" Horizontal Boring Mill

DRILLS AND RADIALS
American 6'x15" Universal, 4'13", 3'9"
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, #16—4 Sp.
Buffalo: Power No. 41, No. 42 RPMSTERS
Canedy-Otto 21" Sliding head, New
Cincinnati Bickford 6'15" col.
Edlund 8" Model 2B, Sliding Head
Natco #12, 20 spindle. Model B2A—10 Sp.
24" Sibley Sliding head
New Geared Box Col. Drills 24"
Foote-Burt #25 3" capacity
Leland-Gifford 2 LMS, 3 MS
Leland Gifford No. 2—4 Sp. Hyd. Feeds
Sigourney 2 spindle

ENGRAVERS
Gorton #ME, 1D, 3U, 3Z, Deckel G1L, G1, G2
Preiss UAM
Taylor-Hobson 3 dimensional Pantograph
New, 3 dimensional Deckel type

GEAR EQUIPMENT
Barber-Colman Mod. SHS, Sharpener
Barber-Colman #3, #2, #12 (3) also Type S.
Brown & Sharpe #3 Gear Mill, 26" Cap.
Fellows High Speed Shapers 712, 725, 71, 7, 61A
Fellows #20M Redliner, Flather 72" Cutter
Gleason Gear Rougher, Gleason #6 Power Tester
Gleason #2 Surface Hardener, No. 3 Gear Tester
Gleason #3 Spiral, #3 Straight Bevel
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
Michigan 1708 Hob & Cutter 8"x24"
Mikron No. 79 Gear Hobbers
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

GRINDERS, SURFACE
New 9x24" Hyd. Feed 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Brown & Sharpe #5, #2 with Chuck
Gallmeyer & Livingston—65
Heald 22—12" chuck, Arter 12", Covel No. 15
Norton—6x18
Portman 12" Chuck Rotary—Reid #3, 11"x36"
Pratt & Whitney 12x36" Vertical
Taft Pierce #1 Precision

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8 and 9 oz. Injection Moulders
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
150 Ton Triple Action HPM Press
250 Ton Watson & Stillman 28x24"
300 Ton Watson & Stillman 24x29"
300 Ton Watson & Stillman 20"x20" Platen 8" St. 19" opening
600 Ton Williams & White 42"x60"
800 Ton Williams & White 42"x60"
800 Ton W&S Hobbing Press

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GRINDERS, MISCELLANEOUS
Brown & Sharpe #2 Universal 14"x28", #3 Univ.
Brown & Sharpe #5, 3"x18" Cylindrical
Brown & Sharpe #13 Universal Tool & Cutter
Bryant #5 Internal, chucking
Cincinnati 6x18" Hyd. #4—Centerless—#2
Douglas Tool & Cutter 8"x15"
Gardner Disc Grinder 30"—15 H.P. Motor
Grenby Models 1G1 & 1G2—Internal
Gorton Ped. Type Tool Grinder Mod. 375-2
Heald #73 Internal Centerless, #75A Internal
Heald 72A3 Int. Centerless Sizematic
J. & L. Thread; TG615, Lempco 54" Swing
Landis 6"x30" Type C Cyl., 10x24 Univ. 12x30
Norton #2 Tool & Cutter, No. 1 Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 10"x18" Type C cylindrical, 6"x30" Cyl.
Norton 14"x96" cyl. 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 6-G Drill Grinder, 6G Tool, K.O. Lee tool
Van Norman #666 Crankshaft

LATHES
American 12"x30", Bridgeford 36"x20", 32"x16'
Bertram 26"x10'
Boyes & Emmes—24" G.H.—Bradford 16"x36"
Gisholt Simplimatic 18"x16½", 2 Tables
Hendey 12"x42" and 12x30", 1941, 14" Yoke
LeBlond Regal 10"x3' bed, 13x42", 17" Late type
LeBlond 25/50x96" Gap, Late type.
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, Duomatics
Pratt & Whitney 16"x60, 10"x20", 16"x36
Monarch Magna-matic 14"x54"
New 16, 18, 20", 28" Immediate Del.
New Tool Maker 10x24", South Bend 9"
Rivett Model 918 Precision. Mod. 715
Putnam, Sliding Gap 22"/46"x92"
South Bend 13"x5' Q.C.G., 10"x3½ Taper Att.
Sundstrand 8x15", 15' Stub
Wickes 32"x35' Geared Head

MILLS, PLAIN, UNIV. PROD.
New #2, Univ., Dividing Hd.
Brown & Sharpe #0 Omniversal, #000 Production
Brown & Sharpe #2B Plain, No. 2, 3A, 21, #2L
Cinn. 08 Rise & Fall 2-24 Automatic
Cinn. #3, 4 Plain, #18 Mfg, #5-48 Hydro.
Kent Owens IV, 1-8, 1-14, 1M, 2-20
Kempsmith #1 Pl., Vert. & Div. Hd.
Milwaukee 2H Universal, 2H Plain
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ., Dividing Head
(8) Van Normans #12—Hor/vert—Late

MILLS, VERTICAL
Cincinnati (2)—1-18 Plain Automatic
Cincinnati #3, 08 Vertical
Cleveland No. 1 table 8"x32"
Gorton 8D Super Speed
Milwaukee 4K & 2K
Morey #12M Profiler, 2 sp. #2 Maximiller
Reed Prentice Vert. Mill & Die Sinker Mod. 3VG
Taylor & Fenn Vert. 6"x18"

PRESSES
Bliss No. 1 Double Action Drawing Presses
Bliss 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss 5-48 Dbl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Horning, 15 Ton—Toledo 32 Ton Horning
Niagara A1¾, O.B.I., Niagara No. 27
Stokes Tablet Presses, Mod. R, RD3, RD35, DDS.
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, LI #3
Z & H #4½, O.B.I. 20 Ton

TURRET LATHES
Bardons & Oliver #2, 3, 7 Bar Feed
Brown & Sharpe, #2 Hand, #10, 11
Foster #2B 2½ Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur.
Gisholt #5, Bar Feed, Plenty of Tools
Gisholt 4R—9¼" hole in spindles
Jones & Lamson, Mod. 8A, No. 5
Libby 1 HS with threading att.—3R, 4R
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1, 1A, 2, 2A, 3, 4, 5

MISCELLANEOUS
Band Saw: New Kalamazoo & Johnson
Bending Roll: Reed-Power 5"
Bolt & Pipe Threader: Landis, Oster-Williams
Broach: New 6 Ton. Horizontal. 11 Ton. Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Jig Borers: New Swiss
Keyseater: Davis, Baker
Pipe Bender, Kane & Roach, Parker tube 1½" Cap.
PLANER: Niles-Bement-Pond 36x36'x10'; Gray 24"x24"x8', Detrick & Harvey 40x90"
Rotary Table: Cincinnati, power take-off
Saw: Shaping 6x6", 13x13", Tannewitz Cut Off
Scrap Cutters & Granulator: Bell & Jewell
Shears: New 14x72, Niagara 10'x3/16", 12'x3/16"
Thread Miller, Coulter Hob, 1952
Welders—Arc-Spot-Seam

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One (1) Snider 25" Back-geared Power Feed and Reverse Drill Press—Condition Fair.

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One (1) Hollow Chisel Mortise Machine #N733—Condition Fair.

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One (1) Chandler & Price Paper Cutter—Condition Excellent.

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TG615 Jones & Lamson Thread Grinder—Late—Excellent
#26 Van Norman Miller
#36 Van Norman Miller
(2) Greenfield #26 Internal Grinders—Serials F4-11255 & 1-11-11982

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No. 25 Heald Rotary Surface Grinder.
P & W 30" Vert. 2-spindle Profiler.
Peerless 6½ x 6½ Hack Saw, hyd.

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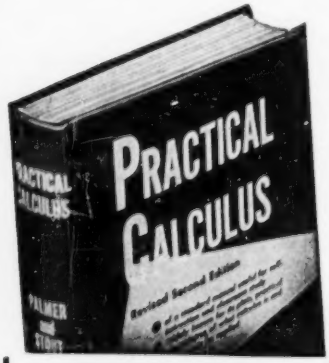

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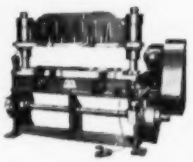

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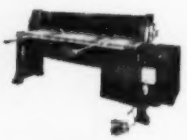

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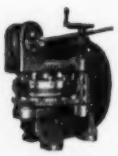

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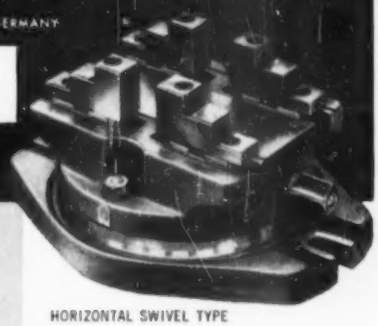

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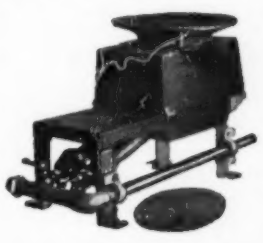

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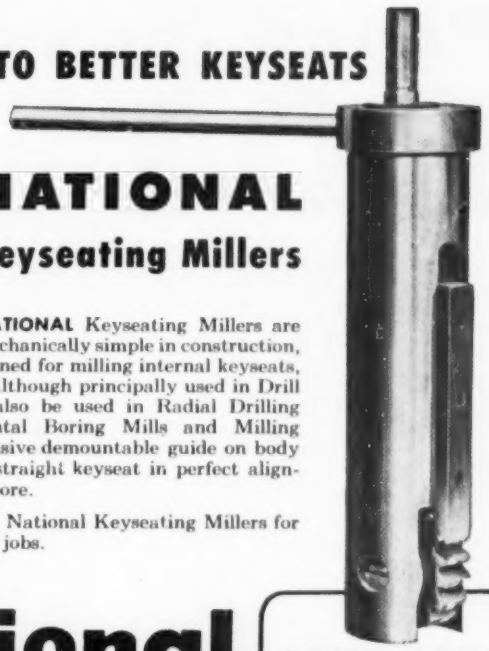

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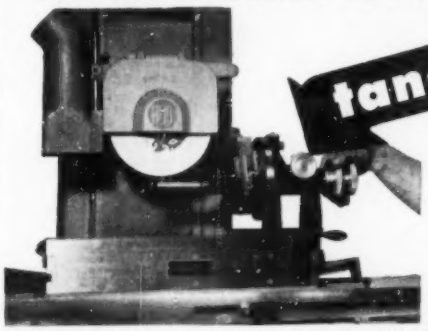

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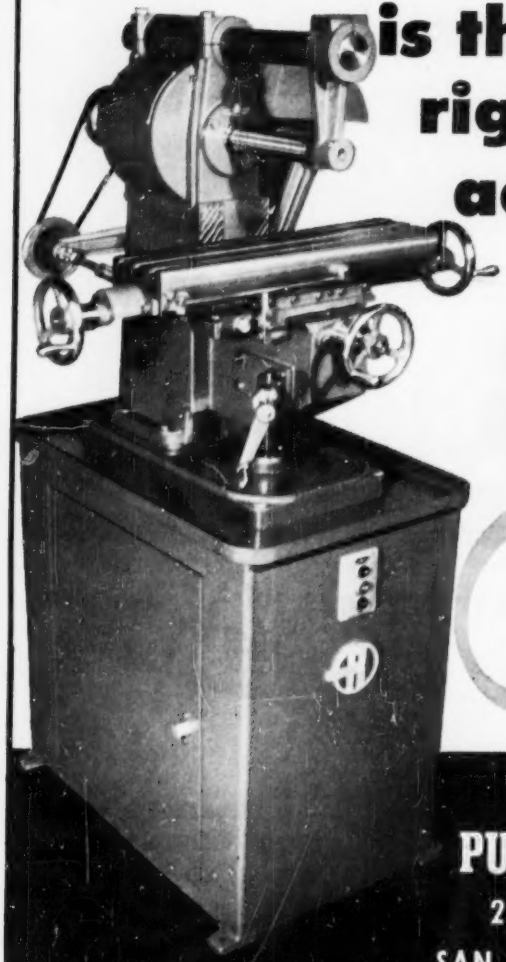

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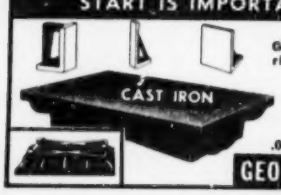

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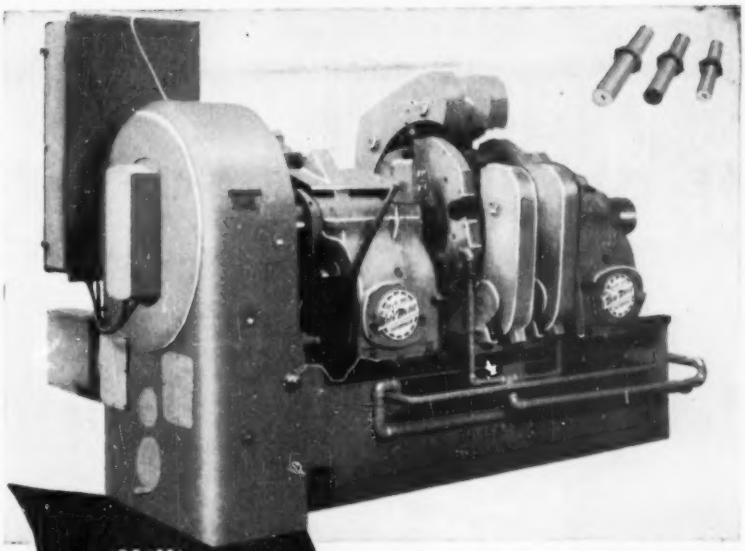


Milling and Centering Simultaneously and in Continuous Production

Here's an excellent example of how two entirely different operations can be combined on one machine. This Davis and Thompson continuous type Roto-Matic both mills and centers on both ends in one operation. Rough and finish milling cuts on the ends of the shaft and centering of both ends is completed with only one rotation of the fixture drum. The centering heads travel with the work station until centering operation is complete then drop back to next work station and repeat. Automatic equalizing clamping is provided to the fixture. Spindles have micrometric adjustment and spindle carriers are adjustable on the ways to accommodate shafts of various lengths.

FREE DATA on this and other Davis and Thompson machines is available in our bulletin No. 1000.

Roto-Matic

Davis and Thompson Co.

4460 N. 124th ST. MILWAUKEE 16, WISCONSIN

TUBE END FORMING MACHINERY for

Beading — Flaring — Flanging — Expanding — Reducing — Sinking — Swaging — Grooving — Double Lap Flaring and Flanging 1/8" to 4 1/2" TUBING.

Write for General Bulletin G-3

The* VAILL *Engineering Company

137 E. MAIN ST., REAR WATERBURY 20, CONN.

The requirements exacted of surface grinding machines leave no room for variation. Precision and tolerance control must be built-in. Through the years Grand Rapids Grinders have demonstrated the highest quality and unquestioned dependability of performance. Upon this record they have been accorded world-wide acceptance as standard of the industry. Here is precision beyond question.

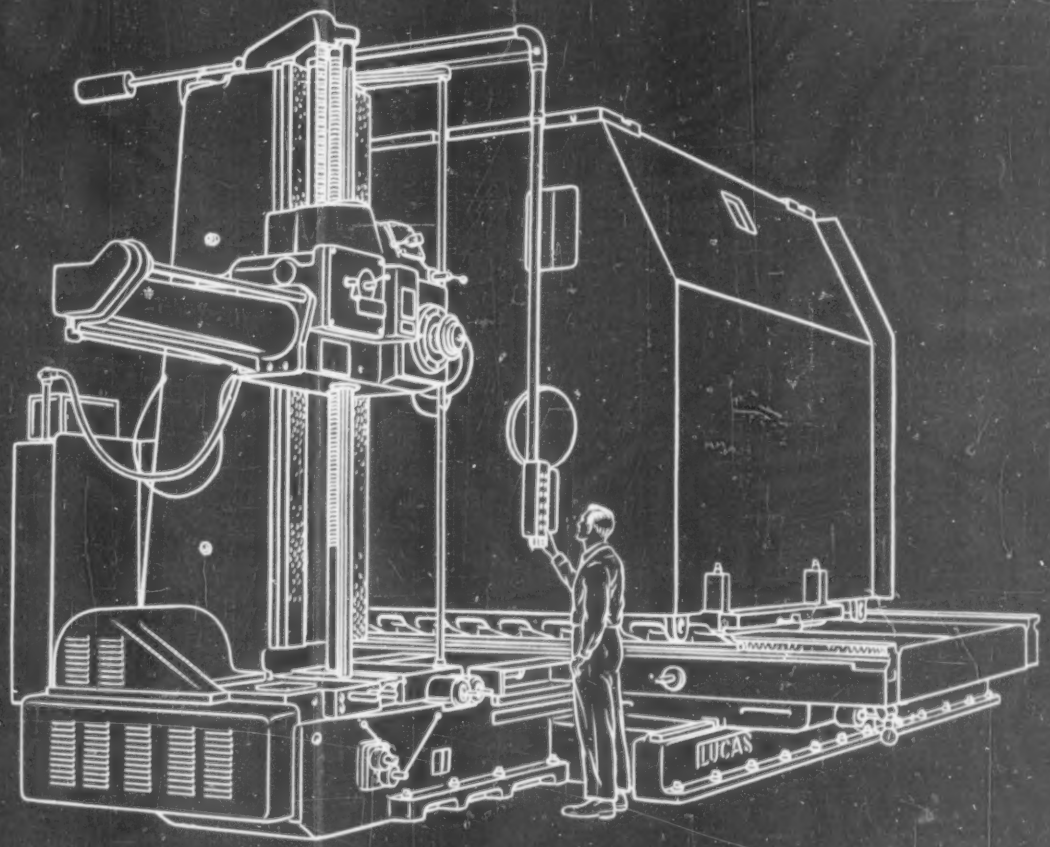
GALLMEYER & LIVINGSTON CO., 200 Straight Ave., Grand Rapids, Mich.

GRAND RAPIDS GRINDERS

GALLMEYER & LIVINGSTON

MANUFACTURERS OF SURFACE GRINDERS, CUTTER AND TOOL GRINDERS, TAP AND DRILL GRINDERS

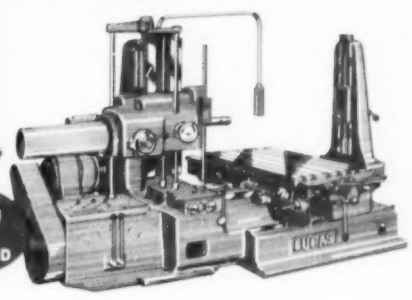
How big work can you handle on a... LUCAS?



A fifty-ton piece is all in the day's work for a six-inch Lucas Precision. You can machine any piece within 8 feet high by 132 inches wide, and 16 feet long where backrest support is required.

THE NEW BRITAIN MACHINE COMPANY
LUCAS MACHINE DIVISION, CLEVELAND 8, OHIO

. . . Machines for Making Progress
Lucas Horizontal Boring, Drilling and Milling Machines



Mills all sides of aircraft fitting in 5 minutes flat . . . *with help of* TIMKEN® *bearings*

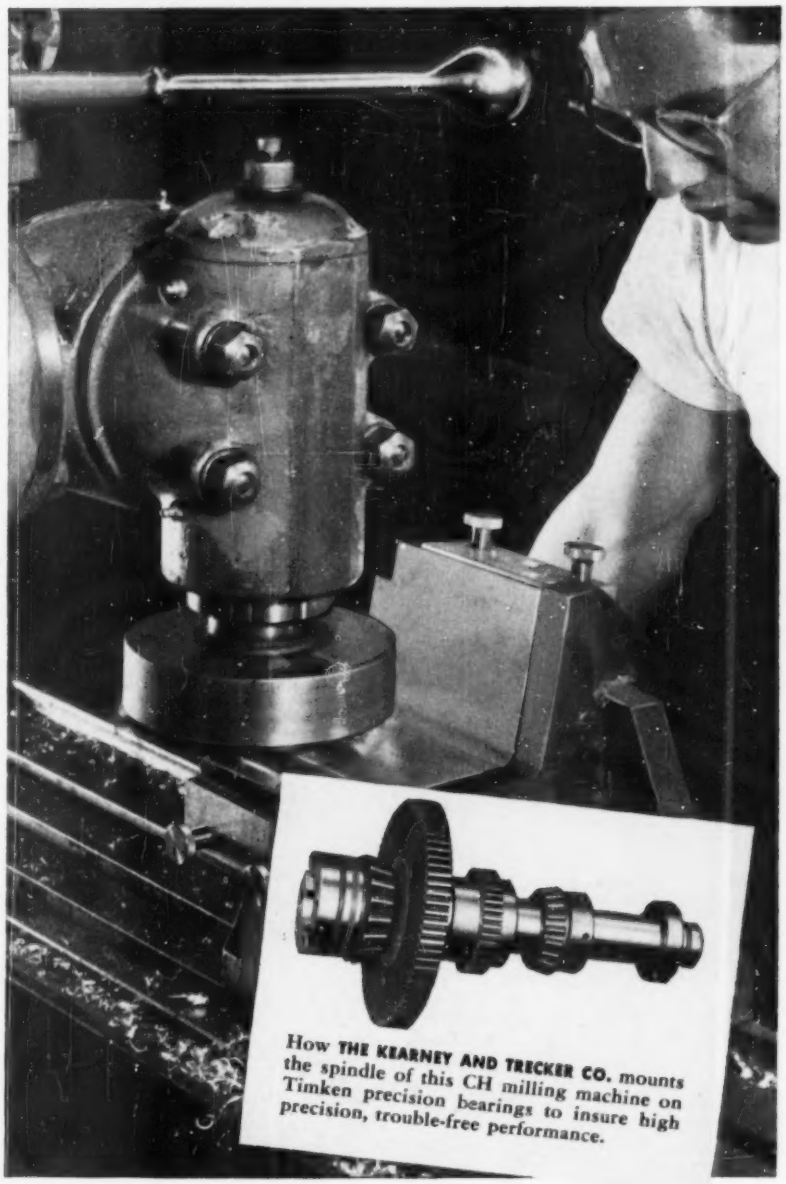
MAKING cuts .050" deep in 75ST aluminum alloy, this Kearney & Trecker Model CH milling machine mills all sides of an aircraft fitting in five minutes. Even at these high milling speeds, spindle rigidity is maintained—the spindle is mounted on Timken® tapered roller precision bearings.

Line contact between their rollers and races gives Timken bearings extra load-carrying capacity. Their tapered construction takes radial and thrust loads in *any* combination and permits fine bearing adjustment. Result: shafts are held in rigid alignment. Shaft deflection is minimized and end-play can be eliminated. Gears mesh smoothly. Spindle precision is assured.

Timken bearings' tapered construction also makes them easier and less costly to assemble. No auxiliary thrust washers are needed. Spindle maintenance is simplified.

No other bearing gives you all these advantages. Specify Timken precision bearings in the machine tools you build or buy. Look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **THE KEARNEY AND TRECKER CO.** mounts the spindle of this CH milling machine on Timken precision bearings to insure high precision, trouble-free performance.

IT'S TIMKEN BEARINGS FOR VALUE!

To get the best value in bearings you may find this simple formula helpful:

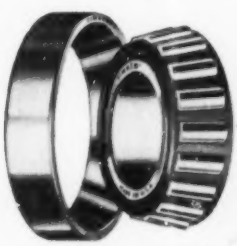
$$Value = \frac{quality + service + public\ acceptance}{price}$$

Obviously a big advantage *above* the line gives you more value than a small one *below*. No other bearing can match the uniform high quality, engineering and field service and overwhelming public acceptance you get with Timken bearings.

TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL — NOT JUST A ROLLER — THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST — LOADS OR ANY COMBINATION